75

OFFICIAL PROCEEDINGS
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A FEW CURRENT OBSERVATIONS

By MR. GEORGE D. OGDEN,
Traffic Manager, Pennsylvania Railroad System, Philadelphia, Pa.

RESERVED

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OFFICIAL PROCEEDINGS
OF

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Vol. XXVII
No. 1.

Pittsburgh, Pa., November 25, 1927.

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Meetings held fourth Thursday of each month except June, July and August.

PROCEEDINGS OF MEETING
NOVEMBER 25, 1927

The meeting was called to order at the Fort Pitt Hotel, Pittsburgh, Pa., at 8:00 o'clock P. M., President E. J. Devans in the chair.

The following gentlemen registered:

MEMBERS

Allan, W. J.
Allen, E. J.
Altsman, W. H.
Beam, E. J.
Biggard, W. J.
Borg, John Edward
Campbell, J. E.
Campbell, J. T.
Cannon, T. E.
Clatty, J. H.
Conway, J. D.
Creighton, D. M.
Croke, Thomas F.
Currie, John
Davis, Charles
Davis, A. G.
Dempesy, P. W.
Devans, E. J.
Durkin, James E.
Eagan, D. F.
Fritz, A. A.
Frauenheim, A. M.
Geisler, Joseph J.
Gilg, Henry F.
Glaser, J. P.
Greene, W. F.
Hamilton, William
Hansen, W. C.
Harris, John P.
Hollingsworth, C. N.
Hoover, J. W.
Horner, William
Hykes, W. H.
Jungbluth, Adolph
Kelly, L. J.
Kennedy, W. R.
Klassen, Fred G.
Kroske, J. F.
Kummer, J. H.
Lanahan, J. S.
Laurent, G. F.
Laurent, Joseph A.
Leckey, Ralph F.
Leonard, C. W.
Lewis, Walter M.
Lobez, P. L.
Miller, John
Mitchell, F. K.
Mitchell, W. S.
Moses, G. L.
Muir, Robert Y.
Myers, T. P.
Myers, W. H.
McHugh, C. A.
McKee, Frederick C.
McKinzie, E.
McLaughlin, H. B.
McNamee, W.
Nash, R. L.
Nelson, R. F.
Ogden, George D.
Oppermann, E. W.
Painter, Joseph
Passmore, H. E.
Rauschart, E. A.
Read, A. A.
Redding, P. E.
Reeve, George
Reid, Samuel
Richardson, H. R.
Ryan, D. W.
Saltic, Thomas
Sattley, E. C.
Schaacke, William
Seiss, W. C.
Severn, A. B.

Shannon, David E.
Sharp, H. W.
Shellenberger, H. M.
Sheridan, T. F.
Simons, Philip
Stevens, L. V.
Stoffregen, L. E.
Stucki, A.
Sutherland, Lloyd
Sykes, A. H.
Tate, R. G.
Tracy, T. W.
Tucker, J. L.
Van Vranken, S. E.
Van Wormer, George M.
Venning, J. C.
Voight, Ben C.
Walther, G. C.
Warner, Russell H.
Wheatley, William
White, A. B.
White, R. H.
Wikander, O. R.
Wildin, G. W.
Wright, John B.
Wynn, Charles A.
Wynn, D. W.
Wynn, M. E.

VISITORS

Baker, J. B.
Beemer, C. A.
Davis, William B.
Harper, Harold S.
Hill, R. W.
Lewis, S. B.
Rizzo, C. M.
Sixsmith, G. M.
Speed, C. M.
Stevens, R. R.
Tate, Paul R.
Trance, F.
Verno, M. J.
Walton, W. K.
Woernley, H. F.

SECRETARY: As you all know, gentlemen, we have had an election and we have with us Mr. Wildin, who has gracefully passed out of the chair, and it is a pleasure to say that we have with us tonight our new President, who will preside at this meeting. I do not know that he needs any introduction; Mr. Devans, General Superintendent, Buffalo, Rochester & Pittsburgh Railway.

MR. E. J. DEVANS: Gentlemen, I greet you. I promised the Secretary that I would not attempt to make any speech. He made the request this afternoon and reminded me of it just now. It is not much of a sacrifice, because I couldn't make one even if I saw fit to try. This is the first opportunity I have had to express to the membership of this Club my appreciation of your having elected me to this honorable and responsible position, and I hope I may be of some service to you.

The call of the roll was dispensed with, the record of attendance being obtained through the registration cards.

The reading of the minutes of the last meeting was dispensed with as they are to appear in printed form.

The Secretary read the following list of applications for membership:

Brennan, T. F., Vice President, B. R. & P. Ry. Co., 155 Main Street, West Rochester, Pa. Recommended by E. J. Devans.

Clifford, C. F. M., Export Engineer, Westinghouse Air Brake Company, Wilmerding, Pa. Recommended by G. W. Wildin.

Davis, A. G., Superintendent, Pittsburgh, Allegheny & McKees Rocks Railroad, McKees Rocks, Pa. Recommended by G. M. Van Wormer.

Dennis, J. G., Freight Train Master, Pennsylvania Railroad Company, 324 Pennsylvania Station, Pittsburgh, Pa. Recommended by J. W. Hoover.

Gunnison, Walter L., Representative, Enterprise Railway Equipment Company, Rookery Building, Chicago, Ill. Recommended by J. D. Conway.

Herrick, Andrew S., Gang Leader, Pressed Steel Car Company, 112 Ella Street, McKees Rocks, Pa. Recommended by G. M. Van Wormer.

Hill, R. W., Chief Account Clerk, Eastern Ohio Division, Pennsylvania Railroad, 249 Cornell Avenue, West View, Pa. Recommended by H. R. Richardson.

Noonan, W. T., President, B. R. & P. Ry. Co., 155 West Main Street, Rochester, Pa. Recommended by E. J. Devans.

Payne, H. A., Credit Manager, Pittsburgh Screw & Bolt Corporation, P. O. Box 752, Pittsburgh, Pa. Recommended by A. B. Severn.

Rizzo, C. M., Agent, P. & W. Va. Ry., Chestnut Street, Castle Shannon, Pa. Recommended by R. L. Barrett.

Stevens, R. R., Draft Gear Engineer, Westinghouse Friction Draft Gear Company, 5 Elmore Road, Wilkinsburg, Pa. Recommended by G. W. Wildin.

Trance, F., Agent, P. & W. Va. Ry., Longview, Castle Shannon, Pa. Recommended by R. L. Barrett.

Verno, M. J., Agent, P. & W. Va. Ry., Bruceton, Pa. Recommended by R. L. Barrett.

PRESIDENT: These applications will be referred to the Executive Committee in due course, and upon approval by them, the gentlemen will become members without further action.

The Secretary announced the death of the following members:

F. I. Mundy, John M. Meyers, A. E. Anderson and Charles Houston.

SECRETARY: I might say that Mr. Anderson was perhaps better known to the members than the others, having frequently participated in our discussions and deliberations. A great many of the members will recollect him.

PRESIDENT: An appropriate memorial minute will appear in the next issue of the Proceedings.

Is there any further business to come before the Club at this time? If not, this brings us to the pleasant part of the evening's program. It is very unnecessary for me to introduce the speaker who has kindly consented to address us this evening, Mr. Ogden being a past President of this Club and probably one of the best known men in Pittsburgh for a number of years, and no doubt at the present time. However, in view of the fact that there are a few new members, I will say that it affords me great pleasure to introduce to you Mr. George D. Ogden, Traffic Manager, Pennsylvania Railroad System, who will address us on the subject, "A Few Current Observations."

A FEW CURRENT OBSERVATIONS

By MR. GEORGE D. OGDEN,

Traffic Manager, Pennsylvania Railroad System, Philadelphia, Pa.

Mr. President and Members of The Railway Club of Pittsburgh:

Some of the happiest recollections of my stay in this City are centered around my membership in this Club, and particularly the honor accorded me to serve as your President. This opportunity to renew, even for a few hours, these associations recalls many pleasant memories and increases my gratitude to the members of this Association, whom I am proud and happy to count as friends. As a native of Western Pennsylvania, I am impressed with the fact that your invitation to be here tonight permits me to enjoy a real homecoming.

The subject assigned to me has turned my mind back to those anxious days when the war still seemed very near and the railroads had just been returned to the control of their owners. General business then, in sharp contrast to conditions now, was highly subnormal—and abnormal as well. In fact,

the confusing processes of post-war readjustment and deflation, which almost culminated in a financial panic during 1921, were just getting well under way.

The members of the Club, I am sure, all remember vividly the 1920 railroad tangle resulting from the pressure of war-time traffic and the difficulties of disentanglement following the termination of Federal control. The war service of the railroads was hard and arduous. The physical condition of their road and equipment had fallen far below standard. Compensation settlements for their use by the Government during Federal control had not been made or even computed, and the railroads, as a consequence, were without sufficient working capital, though facing imperative and immediate demands for large expenditures to rehabilitate them for the proper handling of commercial traffic.

Revenues had lagged far behind the enormous increases in wages and material costs. Traffic, forced out of natural channels during war-time operation, had not yet returned to normal routes. Equipment was scattered over the country to a degree never before experienced. As an example, only 32% of the Pennsylvania Railroad's freight cars were on the lines of the System, whereas normally 80% or more should be on our own lines. The official organizations of the companies were greatly impaired, and the traditional esprit de corps of railroad employes was all but dissipated.

The railroads thus faced a particularly difficult task of restoration, but other lines of enterprise also had stern problems of their own. In 1920, business could see that there was some rough weather ahead. The period of economic readjustment, just then setting in, reached an acute stage in 1921, when the country experienced a severe business depression. In that year the ton mileage of the Pennsylvania Railroad System fell 23% below the figures for 1920. Fortunately, however, marked improvement in general industrial and financial conditions was brought about in 1922, and business got a fair start on the long pull back up the hill. Now, the lost ground has not only been regained, but general prosperity and business activity have advanced to heights never before reached in the history of any nation.

The thoroughness of the come-back of business, industry and transportation is clearly reflected in the American standard of living, which, according to a recent report issued by the Bureau of Internal Revenue, attained in 1926 a level wholly

without precedent or parallel. Because it is human nature to live as well as circumstances will permit, the scale of living of any people constitutes a trustworthy index to the merits of the economic and political system under which they live.

While marveling at the unrivaled prosperity of this country, many of us have been wondering about the underlying causes. They are obviously numerous, but a phenomenon which I shall describe as the new flowering of co-operation seems entitled to recognition as the basic cause.

Large capital investment is the system of political economy under which the leading nations of the world, with one notorious exception, are living and have lived for many years. Its origin is, of course, not American, going back to the earliest times; but in the course of its advance to new heights in the United States, the system has been so extensively expanded, refined and adapted to meet our special needs that what may be termed a distinct American co-operative technique has been evolved. The new factors supplied by the United States are, 1st, almost unlimited natural resources; 2nd, the energy and thrift of the people; 3rd, the vision and boldness of business and industrial leaders; and 4th, fundamental political institutions encouraging individual effort and enterprise under equal freedom of opportunity for all.

It is not surprising, therefore, that corporations, the agencies through which the system operates at maximum efficiency, are larger and more numerous in the United States than in any other country. These huge co-operative enterprises, representing the combined capital of many individuals, have made possible the use of machinery on such a gigantic scale that the American workman has become a director of machinery and the outstanding characteristics of the new American co-operative technique are mass production, quick distribution, steady employment, good wages and heavy consumption.

Although large capital investment like other things of human contrivance, has its defects, most of the civilized world is yet to be convinced that Socialism, Communism or any other proposed system offers more advantages and fewer disadvantages. Soviet Russia merits serious observation as a gigantic experiment in Communism and as history's most ambitious sortie against established industry; but it is apparent that the remainder of the world is not favorably impressed with the results obtained after ten years' trial. As far as the citizens of the United States are concerned, it is no exaggeration to say

that they are quite apathetic about Soviet Russia. This must be true because they are enjoying, under the new conditions, an era of great prosperity and an unparalleled standard of living, while political affairs in Russia, to state the case mildly, would seem extremely unattractive to anyone adjusted to the conditions of life and work prevailing in our own land.

The Internal Revenue Bureau has just made public a calculation that the 117,000,000 persons in the United States had a total income last year of almost 90 billions of dollars, which represents an increase of approximately 27 billions, or more than 43%, in the last five years. The report further stated that the nation's income had increased each year since 1921, and that the average per capita income had risen from $1,637 in 1921 to $2,210 in 1926. In addition, the Internal Revenue Bureau pointed out that the dollar was worth more in 1926 than in 1921, so that the average individual purchasing power of our people has materially increased.

Though these figures are necessarily estimates, their source lends them dignity and weight, and they may be safely regarded as not only interesting, but as indicating the real trend of conditions in this country.

One explanation of our business activity and prosperity is that our people are buying and using more goods than in any previous period. They are not afraid to spend, a trait that is made effective by another typical characteristic,—they are not afraid to work. Even though the nation's resources are virtually unlimited, they would count for little if it were not for the industry of the people.

Many articles which were luxuries a few years ago are now regarded as necessaries of life, and further, a family of ordinary means in this country enjoys comforts and conveniences that are beyond the reach of even well-to-do families in the old world. These are indices of that wide diffusion of wealth in this country, which frequently lead superficial observers to assert that Americans live extravagantly. Automobiles and radios in hundreds of thousands of American homes, which also use electricity, sanitary plumbing and modern heating plants, scarcely can be regarded as having impoverished the people, especially when it is recalled that our people also have $26,000,000,000 on deposit in savings accounts. Twelve years ago, the savings accounts in the country amounted to only $6,000,000,000.

In addition to the phenomenal national income, much other evidence is at hand to support the assertion that the present

American scale of living is without a peer. It can be measured with the living standards of other people by comparing a few fundamental items, such as the following:

We have within our national boundaries only 6% of the world's population, but that 6% uses annually half of all the iron, steel, copper, coal, oil, timber and cotton available to the people of the entire world.

We have nearly half of railway mileage of the world.

We have almost nine-tenths of the world's automobiles,—22 million vehicles, or nearly one for every five persons.

We have in this country 15 telephones per 100 persons as against 3 telephones per 100 in Great Britain, yet Great Britain is one of the most advanced nations of Europe.

We lead the world in the use of the radio and are well on the way to supremacy in commercial aviation, which has experienced a remarkable growth in the last seven years, chiefly under the impetus of private capital. Sixty-six station stops, serving eighty-four cities with an aggregate population of 24,000,000, were linked up in the regular air routes during 1926. The transcontinental air mail route is undoubtedly the finest example of flying in the world today. Most of the flying in Europe is under government supervision, either military or civil.

These comparisons further emphasize the fact that the United States is traveling along at a rapid pace. An observer of big business affairs has asserted, however, that no nation can travel faster than its railroads will carry it. This implies that the railroads must lead the way to prosperity, and an examination of the records shows that such has been the case since the end of Federal control. The railroads' outstanding contribution to our unexampled prosperity was made by increasing the efficiency of the service, and their achievement in this direction has been little short of marvelous. I will summarize for the Class I roads a few of the steps in bringing about this remarkable increase in efficiency of the service.

In 1920, 24½% of all freight locomotives were in bad order. In 1926, this had been reduced to 16.4%.

In 1920, 7% of all the freight cars in the country were in bad order. In 1926, this had been reduced to 6.5%.

In 1920, the average distance traveled by a freight car was 25.1 miles per day. In 1926, this had been increased to 30.4 miles per day, a gain of 21% in the effectiveness of freight car movement.

In 1920, the average freight train was 37 cars. In 1926, this figure advanced to 45 cars, an increase of 22%.

In 1920, the average freight train carried 708 tons of freight. In 1926, this increased to 772 tons, a gain of 9%.

In 1920, car shortages were severe and costly. In 1926, with greatly increased traffic, car shortages were practically eliminated.

The Pennsylvania Railroad, with its far-reaching operations, and its army of employes, it may be modestly stated, is one of the largest corporate enterprises in the world, and a typical example of the modern American business organization. The present dominant position of the corporate form of organizing capital is the result of an evolution of industrial methods in this country covering approximately a century.

A hundred years ago, factories or other enterprises were small and production was low. Then a man, or a small group of men, was able to supply the capital and manage the business, while the employes, enjoying direct contact with the owner and manager, were able to negotiate individually for the sale of their time and labor.

With the coming of machinery, however, trade, manufacturing, transportation and communication began their expansion into the great realms they occupy today, and direct contact necessarily became only moderately possible. The individual owner was replaced by large companies owned by thousands of stockholders, and the individual became a worker in an organization having thousands of employes. This change led to misunderstanding and conflict. In the confusion of readjustment, both management and men failed to perceive for a time that their respective interests are in the last analysis identical, rather than divergent.

The situation finally forced a rather belated appreciation of the importance of proper human relations in industry and threw into bold relief the need for finding an effective substitute for that vanished personal contact between management and employe which, under the more favorable conditions of small industry, invariably nurtured the feeling of unity and partnership.

The development of extensive human relation programs has stimulated the growth of a more enlightened and rational interpretation of self-interest in the collective mind of both employer and employe, and the absence in recent years of serious con-

flicts between capital and labor certainly is due, at least in part, to this new point of view.

Typical human relation programs usually include some procedure for orderly collective bargaining, such as is now generally known as the Employe Representation Plan, retirement and pension provisions, thrift agencies, and employe ownership of capital stock. All these features have contributed to the success of the general program, but we may regard as peculiarly significant the employe stock ownership plans which many corporations have in operation today, because they are transforming thousands of wage earners into employe-capitalists. This function is one of the most encouraging aspects of the new and vast development of industry.

The special merit of employe stock ownership plans is that they make thrift easy and convenient. Capital stock can be acquired through installment payments, taken care of by regular payroll deductions. This mechanism makes employes' saving systematic and automatic, and then carries it along to safe investment.

A device of this nature is a veritable boon to that large class of employes in every organization not previously trained to save by ordinary methods. On the other hand, it enables corporations to recruit thousands of partners from a field formerly undeveloped.

More than 400 corporations in America now have employe stock ownership plans of various types in operation, and the results attained, combined with the ordinary saving by wage earners, constitute an impressive advance in the ownership and use of capital by wage earners. In fact, it is no longer possible to say with any degree of accuracy that this man is a wage earner and that man is a capitalist.

These plans are undoubtedly warranted in part by considerations of company advantage, but every one recognizes a joint benefit to both employe and company from the mere substitution of habitual thrift for habitual improvidence. Any effect of owning company stock on employe morale, on employe attitude toward company affairs or on employe stability is surely of importance, but behind all these plans is a sincere interest in the personal and family security of the individual wage worker, in seeing him get ahead, experience happiness in living and get something put by against life's inevitable emergencies.

Employe ownership, together with the constantly greater proportion of the general public rising into the investing class,

is reflected in the ever increasing number of corporation stockholders. Although the Pennsylvania Railroad Company has not issued any new stock for many years, the number of stockholders at present is 112,277, compared with 90,388 on December 31, 1916. Twenty years ago the number of stockholders totaled only 57,262. The Company has outstanding a total of 9,985,314 shares of capital stock, and the average individual holding at present is just a little over 70 shares.

Employe ownership of stock, therefore, because the plan works well both ways, is now generally conceded to be a perfectly logical and practical development, which seems destined to bring the modern idea of industrial co-operation between men and management to its greatest usefulness.

The relations between capital and wage earners are not, however, the only field in which the growing spirit of co-operation has been instrumental in bringing about notable progress. During recent years business has come to appreciate its own responsibilities, its own duties of self-control—its obligation not merely to keep within the law, but to make its practices conform with the broad principles of fairness and justice beyond what the law specifically commands.

In other words, business is adopting the ethical standards of the professions and in so doing is meriting the designation now sometimes applied to business—"The oldest of the arts and the newest of the professions." This greatly improved and enlightened spirit now largely dominates the competitive and other relations which obtain between enterprises in the same field of industry, as well as the contacts of business in general with the public and the governmental authorities.

This disposition of business to set its own house in order,—or rather to avoid allowing it to fall into disorder—has resulted in a complete reversal of public opinion. "Big business," whether exemplified by great industries or great railroad enterprises, is no longer feared by the public. It is recognized that business to be efficient must in many cases be conducted on a big scale, and that bigness is not synonymous with evil.

"Trust busting" and "Railroad baiting" are not the popular activities they were at the turn of the century. "Less government in business" now largely summarizes the official attitude, which invariably senses and responds to the sentiment of the people.

The immense growth in the power and influence of business, following the advent of mass production about a third of a

century ago, together with the great combinations of capital which were subsequently formed, created a somewhat general feeling, doubtless in some degree justified, that the public welfare required business to be regulated. Obviously, this regulation must be done either by the government or by business itself.

In this country we experimented first with government regulation, as exemplified by the anti-trust laws, and the dissolution suits brought under them, and later by the formation, some 13 years ago, of the Federal Trade Commission.

The Commission was created by Congress to prevent, or at any rate make difficult, unfair practices and unfair and wasteful methods of competition in business. It was supposed to function by giving publicity to its adverse findings, the thought being that public opinion would compel the abandonment of practices so condemned.

It must be confessed that at the start the Commission was not popular with business or business leaders. In fact, sentiment was distinctly hostile to it. On the other hand, it is not going too far to say that the Commission in many respects, during its earlier days, at times exhibited alleged unsound and radical tendencies.

This was an undesirable situation, but fortunately it did not prove permanent. The approach toward a common meeting ground was made by moves on both sides. The Commission, on its side, swung away from the radical viewpoint; business, on its side, moved toward realization of the fact that abandonment of questionable or unpopular practices, or wasteful methods in competition, would be good for business itself as well as for the general public.

What happened was simply that enlightened self-interest brought clearly to the collective mind of business the value and necessity of proper group action and the need for formulating ethical standards of group conduct and service to the public.

These developments are now exemplified in general movements set up in practically every great branch of business, trade and industry, establishing standards of conduct toward both patrons and competitors comparable with those long recognized among the members of the learned professions.

Thus business by voluntary agreement among its leaders is creating what is virtually a new and self-imposed system of law. It is placing the seal of condemnation on abuses or other practices tending to impair the public confidence in the integrity

of business men, or which taint with unfairness the relations of business men with the public or with one another, resulting in wasteful or extravagant competition. Fair and sound practices are thus enforced through the extremely effective sanction of group action and group standards of conduct.

In this work of voluntary regulation, business, instead of being hindered has received invaluable aid from the Federal Trade Commission. In the year 1919, the Commission inaugurated what is generally known as its "trade practice submittal plan." The working of this plan is very simple. A committee, representative of any given trade, meets in conference with one or more members of the Commission. At this conference practices are considered and agreed upon intended to remedy any wrongful condition already existing, and obviate wrongful acts or unfair or wasteful practices in the future.

These proceedings, it should be understood, are voluntary and are not legally binding either upon the trade affected or upon the Commission. In practice, however, they have been found fully as effective as any law which could be formally enacted, and probably in most cases much more effective than actual legislation.

When a set of trade rules has thus been established, the Commission treats any subsequent violation as prima facia evidence of the use of unfair methods. Such violations have not often occurred, but when they have, it has rarely been necessary for the Commission to do more than call the attention of the offending member to the fact that he has broken one of the rules established by the joint action of his own trade.

In other words, the Commission, instead of acting primarily as a policeman to discover and punish wrong-doers, has been turned into a genuinely constructive agency, co-operating with business and helping it by self-regulation to banish unfair and wasteful practices and keep them banished.

Therefore, we have advanced in these respects to such a point that no longer is the attitude of the typical business man toward his customer determined by the old maxim "Let the buyer beware." Instead he is guided by the sound, economic principle of modern business, "Let the seller beware lest he offend the canons of fair dealing that self-regulated business has set up." Confidence instead of intrigue now rules the market place, and our wonderful prosperity of recent years shows that it pays.

PRESIDENT: Mr. Ogden's admirable paper is now before you for discussion and we hope the discussion will be very general. I believe every railroad man here should be willing to add his mite.

MR. A. STUCKI: One statement struck me rather forcibly. If I am not mistaken Mr. Ogden mentioned that the Bureau of Internal Revenue found that the value of the dollar is now greater than it was some years ago. That does not agree with my experience. I wonder just what the basis of that statement is.

MR. OGDEN: The Bureau of Internal Revenue is responsible for the statement that the value of the dollar has slightly increased from year to year since 1921 to date. You will recall I stated that the figures furnished by the Bureau of Internal Revenue were necessarily estimates for the most part, and added that they are reliably correct as estimates, and also that the source of the information lends them dignity and weight.

Mr. President, while addressing the meeting, I cannot refrain from speaking of Mr. Anderson's passing, of which I was unaware until the announcement was read tonight. A great many of you gentlemen, and certainly those who are older, will remember the deep interest Mr. Anderson always evidenced in the deliberations of this Club, and particularly the discussions following the presentation of papers. Mr. Anderson was highly intelligent, and added much to the enthusiasm that has characterized the membership over a long period of years. Mr. Anderson also had a keen sense of humor, and from time to time during my incumbency as President, took a delight in "putting me over the jumps," but always in a graceful and courteous manner. I had the greatest admiration for him and feel very deeply the loss that will be experienced from his passing, both as a valued friend and member of the Railway Club.

PRESIDENT: We would be glad to hear from any one else. I wonder if we could have a word from Mr. Wildin?

MR. G. W. WILDIN: I thought you had heard enough from me during the past year and would be glad to have some one else occupy the floor. I hardly know just what you think I might be able to say after Mr. Ogden's thorough treatment of the subject. He has thoroughly covered the ground, and I have no way of checking his figures to see whether they are correct

or not, so we will assume they are, and proceed to ask some questions which I feel he will be good enough to answer. Mr. Ogden went just to the interesting point and stopped. It is not what has happened in days gone by, but what is going to happen in the future. He has given us a complete history of what has happened, and it is fine. He has told us that they have reduced the per cent of locomotives requiring repairs and materially reduced the number of freight cars requiring repairs. He has increased the daily mileage of freight cars materially and has increased the tonnage of the freight trains themselves. He also mentions that they have had the co-operation of the public in loading and unloading equipment much more rapidly than formerly. All of this means, of course, that we are getting better use out of our present equipment; this has been going on for some time. But when is this saturation point going to be reached and when are we going to get some new business? I am just like you, Mr. President, I do not know just where I am. How much farther are they going to go in reducing these locomotives needing repairs, in reducing these freight cars needing repairs, in increasing the mileage and increasing the average tonnage, and how much more assistance are they going to get from the public to keep us where we are now? That is what I would like to know. If Mr. Ogden has any information along those lines I assure you I would like to hear it.

MR. OGDEN: It seems to me it is perfectly easy. In the first place the tonnage doubles about every ten or twelve years. We can go quite some distance in these refinements and still be confronted with the necessity of greatly increasing facilities to provide for the future transportation needs. We realize that the railroad purchasing power means much to industry, and any adverse effect upon your activities is necessarily reflected in diminished freight revenues.

I ought to apologize for referring to the Pennsylvania Railroad two or three times during my talk, and I hope the gentlemen here representing the other lines will fully understand that I am not trying to advertise. I could not quote any other figures in that little memorandum except what I actually knew about, so I hope you will accept my apology for speaking of the Pennsylvania R. R. I do know we are buying more steel rails this year than in any previous year. I also know that we need some other things very badly. And if business does not slip off too much the first quarter of next year, we may be

reasonably sure that the steel rail policy will be repeated in other directions. I hope so at least.

MR. WILDIN: The steel works are encouraged. I think probably the Pennsylvania Railroad is in the same boat with all the rest of the railroads. They are getting all they can out of their equipment. That is what they are there for. If I were in their places I would do the same thing.

MR. OGDEN: Just remember this, it is a fact that the freight tonnage of this country, as enormous as it is, doubles about every ten years. It cannot go on at that pace and not involve additional facilities, and while there will be dark spots, they will not be of long duration. I am conscious of your conditions here at the moment. We are affected similarly and desire to help, but we must be moderately patient. We must prepare constantly for handling increased volume of long distance traffic. Of course we are being relieved of some short haul traffic, but that is to be expected.

MR. WILDIN: I sure feel an interest in railroads and the railroad situation as I was a railroad man myself for quite a number of years. I find upon inquiry from prominent railroad men on large systems that the natural wastage of equipment is from 4 to 4½ per cent. That much equipment should be replaced annually, yet the very man who gave these figures replaces only 2 per cent in five or six years. That is brought about by making better use of the equipment you have. There is no question but that the railroads get better repairs to their freight car equipment than ever before, and the same is true of locomotives. But some day they will have to buy something and I hope they will go as far as they can.

PRESIDENT: Has any one else anything they wish to add to this discussion? I have no doubt Mr. Ogden can give you further encouragement if you properly put your question as Mr. Wildin did. I notice Mr. Lanahan in the audience. I wonder if he has anything to add.

MR. J. S. LANAHAN: We certainly are glad to have Mr. Ogden back among his friends at the Railway Club, as we have all missed him and from a selfish angle, regret that he was transferred from Pittsburgh to Philadelphia, and hope that he may have the opportunity of attending many of the meetings of the Club.

Mr. Ogden's paper was most interesting and instructive and gave us quite a little encouragement for better business in 1928, even though he states that President Coolidge's famous remark "I do not choose to run" will have to be interpreted that he will not run.

I know that all the members have thoroughly enjoyed not only Mr. Ogden's paper, but also his clever explanation with reference to the various angles of his subject; therefore, Mr. President, I move you that we extend to Mr. Ogden a rising vote of thanks.

The motion prevailed by unanimous rising vote.

There being no further business, upon motion, adjourned.

J. D. CONWAY, Secretary.

In Memoriam

F. I. MUNDY,
Died, September 26, 1927.

JOHN M. MEYERS,
Died, October 21, 1927.

A. E. ANDERSON,
Died, October 30, 1927.

CHARLES HOUSTON,
Died, November 2, 1927.

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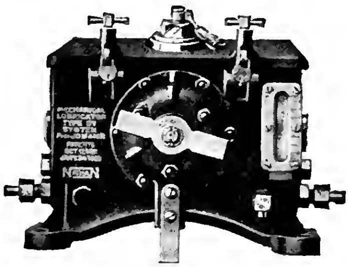

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OFFICIAL PROCEEDINGS

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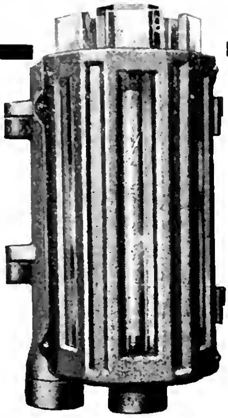
$1.00 Per Year — 25¢ Per Copy

Vol. XXVII. DECEMBER 22, 1927. No. 2.

Why Have We Failed to Make Better Use of the Potential Possibilities of Educational Work for Further Increasing Railroad Efficiency and Reducing Operating Costs?

By MR. D. C. BUELL, Director, The Railway Educational Bureau, Omaha, Nebraska

JOHNSON



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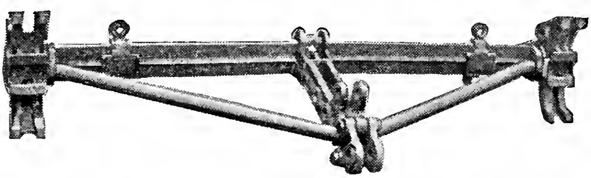

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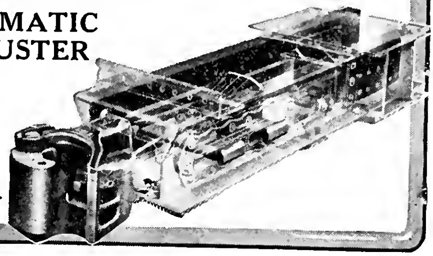

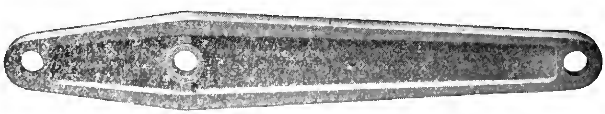

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OFFICIAL PROCEEDINGS

OF

The Railway Club of Pittsburgh

Organized October 18, 1901

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Meetings held fourth Thursday of each month except June, July and August.

PRECEEDINGS OF MEETING
DECEMBER 22, 1927

The meeting was called to order at the Fort Pitt Hotel, Pittsburgh, Pa., at 8:00 o'clock P. M., President E. J. Devans in the chair.

The following gentlemen registered:

MEMBERS

Adams, W. A.
Altsman, W. H.
Bain, George F.
Bald, E. J.
Beam, E. J.
Bowen, James T.
Buell, D. C.
Campbell, J. T.
Christy, F. X.
Clatty, J. H.
Code, C. J.
Code, J. G.
Cohen, Alfred J.
Conway, J. D.
Cooper, F. E.
Corcoran, James
Cotter, George L.
Dambach, C. O.
Davis, Charles S.
Davis, A. G.
Dempsey, P.
Devans, E. J.
En Dean, J. F.
Fenton, H. H.
Falkner, A. J.
Frauenheim, A. M.
Freshwater, F. H.
Fults, J. H.
Gilg, Henry F.
Glenn, J. H.
Goda, P. H.
Haller, Jacob
Hansen, William C.
Harris, Francis C.
Hilstrom, A. V.
Holmes, E. H.
Hoover, R. C.
Irwin, R. D.
Kelly, H. B.
Kelly, H. S.
Knox, William J.
Kummer, Joseph H.
Laurent, G. F.
Leckey, Ralph F.
Lobez, P. L.
Ludgate, B. A.
Lynn, Samuel
Mertz, Jacob
Mitchell, W. S.
Moore, Donald O.
Moses, G. L.
McHugh, C. A.
McKinzie, E.
McLaughlin, H. B.
McMillan, A. P.
McNelty, A. P.
Neff, John P.
Ness, H. S.
Post, F. H.
Pringle, Dr. F. D.
Ralston, J. A.
Reddick, Warren E.
Reese, O. P.
Richardson, H. R.
Rizzo, C. M.
Rodda, G. A.
Sattley, E. C.
Sharp, H. W.
Simon, Philip
Spielmann, J. A.
Stevens, L. V.
Sutherland, Lloyd
Sykes, A. H.
Tipton, G. M.
Trance, F.
Tucker, John L.

Verno, M. J.
Vandivort, R. E.
Van Wormer, G. M.
Walther, G. C.
Warren, A. T.
Wheatley, William
Wildin, G. W.
Wynne, F. E.

VISITORS

Becker, W. H.
Billey, C. E.
Cipro, Thomas
Clugston, H. L.
Crocker, M.
Daniel, Joel E.
Darr, James K.
Davis, William B.
Donachy, D. M.
Farfan, Robert F.
Fletcher, A.
Fullerton, C. N.
Goodwin, Arthur E.
Gotch, Albert
Gotch, N. K.
Gruber, A. P.
Hart, W. E.
Herlihy, J. J.
Hickman, Loyal S.
Hila, Carl J.
Hollar, A. A.
Horton, H. K.
Jackson, Charles T.
Jurnatz, S. F.
Kettler, Louis
Ley, Frank J.
Lewis, S. B.
Livingston, E. M.
Maloney, Joseph J.
Mamayek, Stanley C.
Merton, Robert
Meyer, Stephen J.
Mitchell, W. J.
Murphy, Mack E.
McGinnis, P. B.
Neal, Reese R.
Richardson, H. A.
Robson, Everett J.
Siekie, William
Simpson, C. R.
Smith, Sion B.
Tatrai, George H.
Zecca, C. V.

The call of the roll was dispensed with, the record of attendance being obtained through the registration cards.

The reading of the minutes of the last meeting was dispensed with as they have appeared in printed form and been distributed to the members.

The Secretary read the following list of applications for membership:

Binkley, Walter E., Asst. Car Foreman, Union Railroad Co., North Bessemer, Pa. Recommended by J. T. Bowen.

Burnes, J. E., Superintendent Car Service, B. R. & P. Ry., 133 Warwick Avenue, Rochester, N. Y. Recommended by E. J. Devans.

Burns, E. A., District Claim Agent, B. R. & P Ry., 20 East Long Avenue, DuBois, Pa. Recommended by E. J. Devans.

Cairns, Joseph H., Clerk-Coal Traffic Department, Pennsylvania R. R. Co., 452 Wayne Street, Beaver, Pa. Recommended by H. R. Richardson.

Cathers, C. E., Commercial Freight Agent, B. R. & P Ry., 529 Smithfield Street, Pittsburgh, Pa. Recommended by E. J. Devans.

Cipro, Thomas, Car Inspector, Union Railroad Co., Box 204, Unity, Pa. Recommended by J. T. Bowen.

Cope, E. E., Master Mechanic, B. R. & P. Ry., 101 South Franklin Street, DuBois, Pa. Recommended by A. B. White.

Davis, W. B., Claim Agent, B. R. & P. Ry., 155 Main Street, West Rochester, N. Y. Recommended by E. J. Devans.

Eagan, J. T., R. F. of E., B. R. & P. Ry., 208 West Scribner Avenue, DuBois, Pa. Recommended by E. J. Devans.

Fletcher, Albert, Gang Foreman, Car Department, Union Railroad Co., R. F. D. No. 1, Box 98, Turtle Creek, Pa. Recommended by J. T. Bowen.

Funfar, James, Asst. Gang Foreman, Car Department, Union Railroad Co., R. F. D. No. 1, Turtle Creek, Pa. Recommended by J. T. Bowen.

Gillespie, William M., Attorney, B. R. & P. Ry., West Mahoning Street, Punxsutawney, Pa. Recommended by E. J. Devans.

Gratton, James, Master Painter, B. R. & P. Ry., 119 Stockdale Street, DuBois, Pa. Recommended by E. J. Devans.

Groves, John Q., President, Deposit National Bank, DuBois, Pa. Recommended by E. J. Devans.

Happ, C. R., Signal Supervisor, B. R. & P. Ry., 408 West Mahoning Street, Punxsutawney, Pa. Recommended by E. J. Devans.

Henry, Frank P., General Foreman, Carnegie Steel Company, 36 Danners Avenue, Ingram, Pa. Recommended by William Ashton.

Hershey, Walter, Clerk, Car Foreman's Office, Union Railroad Co., R. F. D. No. 1, Wilkinsburg, Pa. Recommended by J. T. Bowen.

Huntington, H. E., General Passenger Agent, B. R. & P. Ry., 155 Main Street, West Rochester, N. Y. Recommended by E. J. Devans.

Kiser, Joseph A., Jr., Gang Foreman, Car Department, Union Railroad Co., R. F. D. No. 1, Verona, Pa. Recommended by J. T. Bowen.

Lorenzo, Dr. Frank, Surgeon, B. R. & P. Ry., 312 Union Street, Punxsutawney, Pa. Recommended by E. J. Devans.

Margiotti, Charles J., Attorney, B. R. & P. Ry., 720 West Mahoning Street, Punxsutawney, Pa. Recommended by E. J. Devans.

Maurhoff, E. R., Engineer, Westinghouse Electric & Manufacturing Co., 419 Lamar Street, Wilkinsburg, Pa. Recommended by C. L. Painter.

Miles, W. E., President, Miles & Company, Inc., DuBois, Pa. Recommended by E. J. Devans.

Murray, Thomas, Freight Conductor, P. & L. E. R. R., 601 Atlantic Avenue, McKeesport, Pa. Recommended by J. E. Hughes.

McInerney, M. G., Special Representative, B. R. & P. Ry., 4 Willowank Place, Rochester, Pa. Recommended by E. J. Devans.

Nelson, W. M., Supervisor Air Brakes, B. R. & P. Ry., 12 Kent Boulevard, Salamanca, N. Y. Recommended by E. J. Devans.

Ness, H. S., Freight Agent, B. R. & P. Ry., Pittsburgh, Pa. Recommended by E. J. Devans.

Nichol, W. K., Chief Clerk Transportation Department, B. R. & P. Ry., 15 Rumbarger Avenue, DuBois, Pa. Recommended by E. J. Devans.

Niel, Ed A., Freight Traffic Manager, B. R. & P. Ry., 155 West Main Street, Rochester, N. Y. Recommended by E. J. Devans.

Osmand, A. F., General Manager, Hydraulic Pressed Brick Co., DuBois, Pa. Recommended by E. J. Devans.

Peiffer, C. E., Master Car Builder, B. R. & P. Ry., 129 West Long Avenue, DuBois, Pa. Recommended by E. J. Devans.

Post, F. H., Superintendent Stations & Transfers, B. R. & P. Ry., 883 Lake Avenue, Rochester, N. Y. Recommended by E. J. Devans.

Pringle, F. D., Surgeon, B. R. & P. Ry., 205 South Penn Street, Punxsutawney, Pa. Recommended by A. B. White.

Pugh, William, Asst. General Freight Agent, B. R. & P. Ry., 155 Main Street, West, Rochester, N. Y. Recommended by E. J. Devans.

Pugliese, Sebastian C., Attorney, B. R. & P. Ry., Walnut Street, Punxsutawney, Pa. Recommended by E. J. Devans.

Richardson, H. A., Clerk, Pennsylvania Railroad, Co., 806 River Road, Avalon, Pa. Recommended by H. R. Richardson.

Sanders, Walter C., General Manager, Railway Division, Timken Roller Bearing Company, 1133 Fulton Road, Canton, Ohio. Recommended by J. D. Conway.

Shea, D. S., Superintendent Police, B. R. & P. Ry., 302 Olive Avenue, DuBois, Pa. Recommended by E. J. Devans.

Snyder, P. McK., Division Passenger Agent, B. R. & P. Ry., 1927 Morell Street, N. S., Pittsburgh, Pa. Recommended by A. B. White.

Snyder, Samuel, Jr., Gang Foreman, Car Department, Union Railroad Co., North Bessemer, Pa. Recommended by J. T. Bowen.

Stewart, W. W., Sales Manager, Koppel Industrial Car & Equipment Co., 138 Merrimac Street, Mt. Washington Station, Pittsburgh, Pa. Recommended by J. J. Arnold.

Stoehr, Arthur L., Gang Foreman, Car Department, Union Railroad Co., Unity, Pa. Recommended by J. T. Bowen.

Stokes, A. H., Asst. Superintendent, B. R. & P. Ry., 111 Belmont Avenue, Punxsutawney, Pa. Recommended by E. J. Devans.

Thomas, Harrison M., Vice President, Union Trust Company, Pittsburgh, Pa. Recommended by E. J. Devans.

Walker, Mrs. A. Fenton, United States & British Representative, Canadian Railway & Marine World, Toronto, Can., 140 Liberty Street, New York, N. Y. Recommended by J. D. Conway.

Whitmore, John G., General Counsel, B. R. & P. Ry., Ridgway, Pa. Recommended by E. J. Devans.

Wilson, W. R., General Yard Master, B. R. & P. Ry., 329 East Clay Avenue, Butler, Pa. Recommended by A. B. White.

Wray, Edward, Publisher, Railway Purchases and Stores, 9 South Clinton Street, Chicago, Ill. Recommended by J. D. Conway.

PRESIDENT: These applications will be referred to the Executive Committee in due course, and upon approval by them, the gentlemen will become members without further action.

SECRETARY: It is with very deep sorrow that I have to announce the death of one of our past-Presidents, and I will ask you to rise while I make the announcement. Mr. D. J. Redding, retired Superintendent of Motive Power of the Pittsburgh & Lake Erie Railroad, died December 8, 1927. He was as well known to the membership of the Club as any other member. His activities extended over the entire existence of the Club, as he was one of the original 49 who were enrolled as charter members at the first meeting at the Lincoln Hotel in October, 1901. He was wrapped up in the work of this Club, and a great deal of the success that the Club has attained is due to his efforts. His passing is a loss that is going to be felt by all of us.

PRESIDENT: If there is no further business, we will proceed to the paper of the evening. You will notice by the announcement that the subject is "Why have we failed to make better use of the potential possibilities of educational work for further increasing Railroad efficiency and reducing operating costs?" And I am proud to announce that a member of our Club is to address us upon this subject. I take pleasure in introducing to you Mr. D. C. Buell, Director of the Railway Educational Bureau of Omaha, Neb.

Why Have We Failed to Make Better Use of the Potential Possibilities of Educational Work for Further Increasing Railroad Efficiency and Reducing Operating Costs?

By MR. D. C. BUELL,
Director, The Railway Educational Bureau, Omaha, Nebraska.

MR. D. C. BUELL: The title of this address asks a question that may seem to imply a criticism. The question is a fair one. It should be analyzed and answered. The answer will contain no sting of criticism; instead it will attempt to point out a basis for constructive study and analysis of the railway educational problem which will open new channels of thought on this important subject.

No one could successfully defend a statement that railroad executives have not done and are not doing considerable educational work.

Intelligent supervision is largely made up of efforts to educate the rank and file concerning the proper methods of carrying out their various duties. Much supervision takes on the definite form of direct educational work; as for example the provision made for air brake and train rule instruction on practically all railroads.

In the past few years some of the greatest economies that have been accomplished on our railroads have been made possible through direct educational campaigns. Examples are found in the fuel economy campaigns, the loss and damage campaigns, and akin to these in the safety campaigns.

Particular attention is called to the use of the word, "better" in the title of this paper. The question does not read, "Why have we failed to make **any** use of the potential possibilities of educational work?" but instead it reads, "Why have we failed to make **better** use of these potential possibilities?" It is seen, therefore, that the question does not imply a criticism. Instead it is designed to focus the attention of railroad executives on two facts: First, that educational work has already saved millions of dollars in operating economies; Second, that there are still many other millions of dollars that can be saved if each railroad will study its own educational problem and then devise or adopt a practical training program and follow it up.

It has not been the custom for railroad executives to include a study of educational methods in their list of important operating problems requiring personal analysis.

There was a time too, when it was not the custom for executives to give any personal attention to fuel economy. It is likewise true that the results along the line of fuel economy were negligible until executives personally analyzed the problem, personally developed a program, and manifested a continued personal interest in the subject.

Fuel economy is mentioned because it is an outstanding example of the effectiveness of practical railway educational work applied to a specific operating problem. There are literally dozens of other operating problems that can be attacked in a similar manner with the promise of proportionate results, but—

The potential possibilities of the subject are so great that

the matter should be considered from the standpoint of a definite constructive program rather than from the standpoint of the solution of unrelated individual problems.

It would be impractical to ask any railroad executive to study and analyze all of the phases of operation where applied educational work would result in economies.

There is another and better approach to this subject that is based on fundamental principles—one that is comprehensive in its scope and inclusive in its possibilities of results.

Sporadic and unrelated attempts to educate individual groups of employes on various special subjects only scratch the surface of the problem.

Of course apprentices should be taught their craft work, but why specialize on them and ignore other groups. Such special group teaching should go hand and hand with, and be strengthened by a comprehensive general program.

Fundamentally there are three groups of men to be trained:

Group 1. Officers from the staff down to the newest foremen.

Group 2. New employes above the rank of common laborer, who are to become permanent employes.

Group 3. All the remaining permanent employes, exclusive of common laborers.

The training of Group 1 is all important if lasting results are to be expected.

The training of Group 2 can be carried on at the same time Group 1 is being trained.

It is impractical to attempt any systematic or comprehensive training of Group 3 until the training of Groups 1 and 2 is well under way.

It is possible that the above statements will be challenged. May I proceed to enlarge upon, and prove my theorem?

A very prominent railroad executive in discussing the problem of supervision made a fundamental statement when he said "The first duty of any officer is to develop the men coming under his jurisdiction. This cannot be done without their being taught how a thing should be done and why it should be done."

The Chairman of the Board of the American Management Association, puts this same fundamental principle into other words as follows: "One of the mistakes that has been made * * * is that attempts were made directly to reach and educate the worker before the problem of training the staff had been

dealt with. * * * An executive's job is that of training and developing each subordinate. * * * We cannot escape the fact that competency or incompetency of management to think, lead, and educate others, will have a profound influence in molding the lives and personalities of the workers in their establishments."

The Chairman of the Board of an important group of railroads summarized the duties of an officer in these words, "It may be said that he should analyze, observe, and teach, and should furnish an additional pair of eyes through which the management sees the property."

Before supervisors can properly teach those under them, they themselves must attain to a reasonable standard of proficiency.

Present day railroad conditions call for results. To obtain results, the supervising staff must have certain fundamental training. Haphazard methods must be replaced by the systematic planning and scheduling of work. Traditional methods must be replaced by methods that have been proved effective by careful analysis. Accurate records of results must replace guess work in measuring output. Supervision must become intelligent and to a certain extent, scientific.

Supervision training embraces three distinct branches:

1. Training in the understanding of folks and the handling of men.
2. Training in the fundamentals of modern methods of scientific management.
3. Training in the technique of the work being supervised.

More supervisors fail through their inability to handle men understandingly than through lack of practical knowledge of their work.

The foreman who is gifted with the ability to handle men likewise fails to keep step with modern methods unless he understands certain fundamentals of management. Among these may be mentioned the planning, scheduling, routing, and dispatching of work, the importance of standards, and of the use of standard practice instructions, the necessity for studying production units, production results, and production costs, the necessity for ability to analyze reports and statistical information, and to prepare proper records of performance.

A mere knowledge of these fundamentals is not sufficient Someone has pointed out that there is a vital distinction be-

tween knowledge and intelligence, explaining that a man may have a sufficient knowledge of his work to pass a splendid examination and yet not have the intelligence essential to the safe and economical handling of the work in his charge.

Supervising forces must also be taught how to apply their knowledge intelligently to their every day problems. This involves training in analytical ability and the development of the power of observation. In addition, it calls for at least a moderate amount of that priceless attribute, common sense, which in turn insures a reasonable amount of good judgment, tact, and adaptability.

Item 3 refers entirely to the technique of the work coming under the supervisor's jurisdiction. It is highly desirable, although not always absolutely necessary, that a supervisor have a thorough practical knowledge of the technique of the work he directs. A supervisor not equipped with such knowledge finds it difficult properly to instruct his men and develop them.

The keynote of the whole educational program is found in the proper training of supervisors. More will be said of this later.

The necessity for, and the benefit of educating the second group concurrently with the first is largely self evident. In the case of apprentices, there is a real obligation in the indenture, to train the boy to become a master craftsman. All new employes entering the service of the company in any department to learn a branch of railroad work, should be considered as apprentices and be made subject to definite compulsory educational requirements.

The third group presents a very different problem.

The majority of railroad employes work according to agreements or schedules entered into between groups of workers and the management.

These agreements, among other things, specify standard rates of pay and seniority rights. In no case do they set up definite requirements of knowledge for different jobs.

The ordinary railroad worker who conforms to the rules laid down by the railroad company and has a fair amount of seniority is practically assured of a steady job, even though lack of thorough knowledge concerning his work may give him a comparatively low proficiency rating.

Stated in cold-blooded terms, if such a man is not ambitious for promotion and is satisfied just "to get by with his

job" he has no positive incentive to increase his knowledge by study.

Let there be no misunderstanding at this point. There is a certain percentage of the employes on every railroad who are so ambitious and so interested in their work that they voluntarily take the time and assume the expense of taking up outside training; but this number on the average is only 10 per cent of the group. This 10 per cent is well worthy of every encouragement. It is from this 10 per cent that the majority of minor supervisors are selected.

Most of the educational plans proposed to railroads have been concentrated on Group 3. The lack of success of such efforts is an indication that there is some foundation to the theory that this group can only be reached effectively after some progress has been made in the training of Groups 1 and 2.

Someone may suggest compulsory educational requirements for this group. It would not be fair to impose a compulsory educational schedule on the general run of permanent employes because compulsion implies a penalty for failure to comply. Compulsion, however, is perfectly proper in the case of apprentices or other new employes, or in cases where such education is necessary for the safety of the public who are patrons of the Road.

The problem as I see it is to create a positive study incentive for all employes that is reasonable and fair. It is doubtful if it is practical to create a lasting incentive of this kind without first passing through a period where the incentive is negative in its nature.

May I explain what I mean by the expression, "negative incentive?" Let us take for example, a road which has in effect a really proficient system of apprentice training, not one where boys are merely given elementary instruction. Apprentices who are trained under such a system graduate at the end of four years as real craftsmen, practical in their shop work, and trained in the technique of their trade. It is not necessary to wait the full four years required for such an apprentice to complete his training, before the comparison of his knowledge of his craft with that of the mediocre, untrained workmen becomes apparent.

There is still no positive incentive for the mediocre workman to study, but there is a definite negative incentive created, in that it is human nature for the workman to wonder whether

he can afford to let a second or third year apprentice go away ahead of him in knowledge or equal him in skill.

This negative incentive may for the first time turn the thoughts of this mediocre workman to the necessity for studying so that he may maintain his own self respect and his craft status in comparison with second and third year apprentices. This is only one of the many similar examples that could be cited.

An incentive of a negative nature such as has been described is not a permanent solution of the problem. What is wanted is a positive incentive.

The setting up of this negative incentive is a preliminary step toward the creation of a positive incentive. The positive incentive is based on the establishment of a standard of knowledge and intelligence for each particular classification of workmen. This is the desired objective.

We lack standards of knowledge and intelligence for supervisors as well as for employes. The failure to establish such standards is the main reason why we have failed to realize the importance of a comprehensive educational program to train men to fulfill the requirements of their positions.

The foregoing explains in part why our educational endeavors have not been more productive of results.

If the problem has been clearly and correctly stated and has been found worthy of further consideration, the first step toward its solution has been accomplished.

It is doubtful if there is a single railroad executive in the country today who fails to realize the potential possibilities of educational work. Failure to make better use of these potentialities is due to a lack of faith in suggested methods. Executives have seen so many plans fail that they demand real assurance of success based on personal analysis, before approving further programs.

Many railroad executives have been disappointed in their failure to receive greater help in the solution of this problem from educators. They have learned that much educational theory is impractical of application to railroad problems.

It is only within recent years that educators as a group have begun to realize that the problem of adult education is separate and distinct from the problem of child education. Even today comparatively few educators realize that the application of adult educational methods to industry requires vision gained

through practical knowledge of the needs of each individual industry.

The educator asks why the railroad president does not wildly bid for college graduates to enter his organization. The railroad president asks the educator why his college graduates are not trained to fit in and grow with his organization. The educator presents to the railroad president, plans for foremen-training. If the railroad president tells him to go ahead and experiment, soon they both become doubtful of the effectiveness of the trial. The situation today is more or less at a deadlock, each side wishing to go ahead, but neither side sure of its next move.

The present day consideration of new railway educational methods is further complicated by the attempts of some educators and scientific experts to becloud the fundamental requirements with discussions of popular educational fads of recent years, rating tests, psychological tests, cultural side issues, etc. These specialties are out of place except when intelligently applied as incidentals of a comprehensive program.

The Carnegie Foundation, during the past few years, has made an extensive study of the problems of adult education. This study has developed the fact that there is a widespread and sincere desire on the part of adults for both vocational and cultural education, but that lack of understanding of the problem, dearth of practical texts for adult study, and lack of properly trained and sympathetic instructors discourages the adult seeker for education to such a degree that the results are meager in proportion to the number eager to be served.

While it is granted that there is a widespread desire on the part of adults for broader educational opportunities, this desire is by no means confined to craft education. Comparatively few men have any burning desire to study their own work although they may voluntarily start on the study of some subject in nowise related to their work. The grass always looks greener in the next field. A railroad educational program will naturally be planned to make employes better informed, safer, and more efficient workmen, with cultural education included as a secondary factor.

The railroad executives will be the ones that will work out a practical solution of this problem. Their solution will include the helpful co-operation of available experts and educational agencies.

A question has been asked and answered. The answer has

pointed out the lack of, and need for a comprehensive educational program on our railroads. It has been demonstrated that the program, to be comprehensive, must include instruction for both the rank and the file.

It is seldom satisfactory to generalize on a subject without giving some assurance that the principles discussed can be applied concretely to the problem under consideration. It is logical, therefore, to pass from generalizations to the consideration of concrete plans for a railway educational program. The discussion is not intended to lessen anyone's interest in any good educational project already planned or under way, but rather to suggest improvements in present methods while the establishment of a comprehensive program is being considered.

Analysis and study of the educational problem offers more alluring possibilities of further reducing operating expenses than any other subject claiming the attention of railroad officers.

The present analysis will be confined to the consideration of one department. This will avoid the necessity for further generalization.

The Mechanical Department is selected because of the vast sums of money spent on maintenance of equipment, because considerable educational work has been done in that department, and because much progress has been made in modernizing mechanical department work along scientific lines.

Under modern railway shop methods, haphazard work is replaced by skillful planning; traditional methods are replaced by methods that are proven effective by careful analysis; guess work in measuring output is replaced by accurate methods of measuring results. Thus supervision must become intelligent and to a certain extent, scientific instead of haphazard.

The modernization of railway shop methods has bewildered many supervisors. They have neither been able to understand the new methods, nor keep step with the new requirements. . So many have fallen by the wayside during the transition that it is a difficult problem on a number of roads to find satisfactory men to fill promotion positions.

Executives have realized that foreman training is necessary. The staff meeting was the first plan devised to meet this need. It has proven quite effective when proper programs have been provided. A number of other foreman training plans have been tried out—some with more success than others.

It is not necessary to stress further the necessity for fore-

man training. The question is, how can it be effectively accomplished?

The new shop conditions call for an understanding of the fundamental principles of modern scientific management. The discussion of the incidents and details of supervision can be taken care of at the staff meetings. What is needed, therefore, is training in the fundamentals of scientific management as they apply to railroad work, and practice in the application of these principles to the everyday problems of railroad supervision.

The problem sounds simple. What has hindered it being solved long before now? The difficulty has been due to the fact that there were no texts available that were written in simple language from a practical railroad point of view. The professor with his college textbooks did not solve the problem.

It has been necessary to wait for the development of practical texts and teaching methods for foreman training before a general educational program could be considered. Such texts and teaching methods are now available.

The one remaining objection is that supervisors are too busy—too tired at night to do any studying. The answer is that the supervisor who has the executive ability to run his job instead of letting the job run him is not necessarily overworked. The others who lack this ability will always be overworked until they learn the fundamentals of supervision which will allow them to differentiate between the essential and the non-essential, to conserve their time, to anticipate and prevent failures, and thus to develop the executive ability they now lack.

No definite program of classes or home study work, hours to be spent, subjects to be studied, problems to be worked out, etc., is suggested. Any railway educational plan must be elastic enough to be readily adapted either to the conditions of the large shop or to those of the small terminal point.

Given the desire to train these men, suitable texts and a willingness to analyze the problem and a solution can be found.

The training of apprentices, as has been previously stated, is an obligation of management. The fundamental soundness of having graduate apprentices standing by ready to step into vacancies caused by the normal labor turnover among mechanics, is proved by the fact that there are only one or two railroads in the United States that do not employ apprentices. Apprenticeship is a recognized feature of railway shop practice.

The obligation on the part of the railroad to give these ap-

prentices proper training is usually contained in the indenture of apprenticeship. Practically all mechanical officers are in favor of apprentice training. Still, there are many roads that employ apprentices where there is no apprentice training plan in effect.

Why does this condition exist? It is not a case of unwillingness to spend the money because proper apprentice training pays for itself many times over. It is not due to lack of interest.

Primarily it is due to lack of faith in proposed plans, either because of knowledge of previous failures or on account of the realization of the ineffectiveness of certain traditional training methods still in effect.

New conditions call for improved methods. The modernization of railway shop methods that has taken place in the past few years should have been accompanied by a modernization of apprentice-training methods.

In the old days apprentice classes could be held during working hours without undue interference with shop routine. Perhaps it was not required to have the class instruction cover more than elementary mathematics and mechanical drawing. It may not have been thought necessary to keep a record of the progress of each apprentice nor to discipline apprentices showing no interest or aptitude in their study work.

A survey of apprentice training on a good-sized railroad made just a few months ago disclosed the following facts:

(a) Less than 40 per cent of the total number of apprentices employed received any instruction at all.

(b) Apprentices who were receiving instruction were not required to accomplish any definite time schedule of study progress although classes were held during working hours and apprentices were paid regular hourly rates for attending classes.

(c) No disciplinary action was taken in cases where apprentices failed to make reasonable progress or show reasonable interest in their class room work.

(d) Apprentices were not furnished textbooks for class room guidance or for home study. In fact, there was not even a definite study program set up for the boys to follow.

(e) Apprentices were not required to submit written examinations to prove their progress.

(f) Apprentices were not furnished any instructions on their particular craft work.

Such a plan fails to accomplish its intended purpose of setting up a standard of craft knowledge and intelligence. Furthermore, figuring the average rate for regular and helper apprentices over their three and four year training period, and multiplying this rate by the average hours per year that apprentices attend classes discloses a fact not generally realized.

The cost of lost shop time due to holding apprentice classes during working hours amounts to approximately $80.00 per apprentice per year. This does not include the salaries of instructors, the cost of class room supplies, nor the overhead charges for heat, light, space used, etc. Furthermore, it does not include the loss of shop production due to the interference with shop routine that is caused by boys leaving work arbitrarily to attend classes.

Within the last two years two railroads desiring to re-establish apprentice instruction applied to the problem the same analytical consideration given to other phases of their Mechanical Department work. The preliminary study by Mechancial Department staff officers, included a survey of all then-existing training methods as well as of outside training facilities that might be available. A committee personally investigated such plans as gave promise of practicability. The analysis indicated certain desirable fundamental requirements:

1. There must be no disturbance of shop routine.
2. The training must be adapted to the craft requirements of the eleven different classes of apprentices employed.
3. The training must be compulsory so that boys not sufficiently interested in their work to become good mechanics would eliminate themselves from the service.
4. The training should be uniform over the entire System.
5. The training should include all apprentices wherever located.
6. The training should be sufficiently complete so that graduate apprentices would establish a new standard of knowledge and intelligence for their craft.

A plan was developed and adopted that meets all these requirements. The total expense of the plan including all items is less than $50.00 per apprentice per year.

Training is furnished without expense to the apprentices, but each apprentice agrees to study at home and on his own

time. The Committee representing the shop crafts amended the agreement to make the training program compulsory for apprentices. The penalty for failure to conform to the study schedule is elimination from the service. The plan is sufficiently elastic to be as adaptable to the training of the several hundred apprentices at the large shops as it is to the training of the single apprentice employed at some of the smaller points.

Results become quickly apparent. The boys learn discipline and personal responsibility in addition to a better understanding of the requirements of their jobs. Foremen are able to make effective use of apprentices up to the full ratio allowed in the agreement.

Figuring the average hourly rate of all apprentices during the period of their apprenticeship and comparing it with the rates of mechanics, discloses the fact that the actual value of each apprentice used in place of a mechanic is approximately $700.00 per year. The more effective use of apprentices on many railroads will more than offset the cost of an apprentice training system.

Take for example, a road that employs 1000 mechanics. If the agreed ratio is 1 apprentice to every 5 mechanics, the road could use 200 apprentices. Suppose due to the lack of a proper apprentice-training program, it has not been considered practical to employ more than 150 apprentices. The loss, resulting from the failure to use the full allowance of apprentices amounts to 50 times $700.00, or $35,000 per year. This is three times the necessary total cost of proper training for 200 apprentices.

Do I make myself clear? Each time a mechanic is employed to do work that could be properly performed by a well trained apprentice, the extra cost of such work is at the rate of $700 per year. Such a saving is possible in all cases where less than the full quota of apprentices allowed by the agreement is used.

If the analysis of shop force reports shows that less than the allowable ratio of apprentices is being used, that does not necessarily mean that the condition can be remedied over night. It may require the establishment of apprentice training if none is in effect, or the modernization of an old apprentice system before the skill of apprentices justifies the use of the full allowed ratio. The fact that the full ratio is not in use indicates the positive need of analysis and the possible need of legislation.

It is doubtful if all railroad executives have studied the

apprentice problem from a dollar-and-cents standpoint. Such an analysis discloses surprising figures.

A secondary result of proper apprentice training is demonstrated in the inquiries of mechanics as to the possibility of their taking training similar to, or in advance of that which apprentices are receiving. It will be noted that this is exactly in line with the statement previously made that a negative incentive to study is created while standards of knowledge and intelligence are being established.

The foregoing is a brief analysis of the possibilities of a few applications of educational work to mechanical department problems. A similar analysis can be made of the educational possibilities for any department of a railroad. Interesting developments will be found wherever a proper analysis is made. When the needs of a situation are determined, educational methods to fulfill these needs can be devised.

Even a well-thought out program does not admit of instant realization or fulfillment. Such plans cannot be put into effect by proclamation. Results can only be expected following careful analysis, proper consultation, wise planning, and able administration.

Thus we come to our conclusion.

Present day railroad practice has developed the necessity for a systematic training of supervisors in the fundamentals of modern management.

With such training supervisors can make use of standards of knowledge and intelligence for individual classes of workmen.

Standards of knowledge and intelligence for individual classes of workmen can be developed by a proper training system. Such standards are automatically set up for each shop craft at the end of a four-year cycle with proper apprentice training in effect.

When such standards have been set up, supervisors will be in a position to demand a reasonable conformity to the standards on the part of the employes under their jurisdiction.

When such standards are set, employes themselves will then have a positive incentive to study in order to fulfill the requirements of these standards.

Finally, when these conditions obtain, the reasonable standards of knowledge and intelligence which have been set up, will be such that supervisors and men will have a clearer and better understanding of their responsibilities, their duties, and the desirable ends which they are striving to accomplish.

PRESIDENT: There is a lot of meat in that nut Mr. Buell. I am sorry our entire membership, or at least as many as could be gotten into this room, could not have been present to hear it. I want to call the attention of our members to the number of young faces in this section of the room. They are future executives of the Baltimore & Ohio Railroad, being members of the Baltimore & Ohio Apprentice Club, and I will ask Mr. Gotch, President of the Club, to stand up and introduce his boys. We are mighty glad to have you with us.

MR. F. K. GOTCH: Mr. President and Gentlemen: We were asked to come down here this evening, not to show ourselves, but to learn something. And I am sure we are all glad to be here and listen to the talk of Mr. Buell. We were very much interested in his address, and in the audience here. I assume they are executives of the different railroads, and it is a surprise and a compliment to us to be associated so intimately with persons of that kind.

Our Club is rather small as yet, but we are growing and intend to keep on growing in the future. There is no reason why we should not have a large club, because we are organized to better ourselves and our fellow-apprentices. We hold meetings in a drawing room of one of the Junior High Schools of Pittsburgh through the kindness of the Superintendent of that School. And we get together and try to thresh out our difficulties and our problems together. And we believe that we get a better and a clearer understanding of them than we would if we tried to dig them out as individuals, for we would then only get a single point of view of the problem.

I am not prepared to say very much about our Club, for I only had a few moments' notice that I would be expected to say anything, and I am rather stuck.

PRESIDENT: Do not have any misunderstanding about this being a railway executives' club. It is not. It is a railroad men's club, and if you join the Club you will find that out.

Mr. Buell's paper is now before you for discussion. I will ask Mr. Wildin to open the discussion.

MR. GEORGE W. WILDIN: This subject is rather for railroad executives to discuss than for the supply men. But I want to say that Mr. Buell's conclusions are sound. The trouble in the past has been that the apprentice problem on the railroads has not been made a business proposition. While we have heard a great deal from various places in the country about

the great progress that they are making with their apprentice schools, sooner or later they fade away and we hear no more about them. There is no question but that the railroads should take a greater interest in the development of aprpentice systems. They should have, as Mr. Buell pointed out, a definite course of study planned out and a good corps of instructors, and insist on the apprentices attending classes; and they should have an educational standard with regular examinations. In fact I feel that the apprentice schools on the railroads should employ practically the methods of regular colleges or high schools or any other institutions of that sort. If the boy does not show the intelligence that is required he will never be the kind of man you want to bring up to a high executive position.

I am glad to see this bunch of young men here from the B. & O. I was interested to hear their leader point out what they are trying to do. It is a noble purpose, and I congratulate them. I want to say to Mr. Buell that I have enjoyed the paper and I think this Club is fortunate to have had it presented to them at this time. I want to say just one thing more, and that is that if the apprentice boys and the instructors get together and work together there is no question but that we will have a better class of mechanics and a better class of supervisors and a better class of officials in the future than we have ever had in the past.

PRESIDENT: Next I will call on Mr. Donald O. Moore, in charge of traffic, Chamber of Commerce.

MR. DONALD O. MOORE: I enjoyed the paper very much and it seems to me that the railroads could do a great deal of good by trying to sound out some of the qualities of the young men who go into their employ, not necessarily all those who go into the shop, but they may have a great many employees in other lines. As Mr. Buell said, the grass is always a little greener in the other field, and if we could only keep these young fellows from jumping from one activity to another, and stick to one thing until they develop what is really in it, they would make a great deal more progress in the long run. I have a great many people coming to me in the Chamber of Commerce seeking positions, some of them in the selling line who have not done very well and want to know if it is not possible to get them into the traffic line, and other fellows in other lines, all wanting to jump over into something else. If they would stick a little longer and work a little

harder they might get over the top. That is one thing where the railroads could do a great deal of good, if they would find out just what those young men are suited for and then encourage them to study along those lines to make themselves more efficient.

PRESIDENT: May we have a word from Mr. H. B. Kelly, General Road Foreman of Engines, P. & L. E.

MR. H. B. KELLY: I can fully agree with everything the speaker has brought out in his paper this evening and I will say that we cannot do too much educational work in the Railroad game, in regards to apprenticeship classes.

On the Railroad on which I am employed, which is the Pittsburgh & Lake Erie, we have been running these classes in our locomotive shops for several years and I believe that we are one of the pioneers in this work, as far as the Railroads are concerned. We also conduct instruction classes for locomotive firemen and train men.

Further, when we apply any new device to our locomotives, such as stokers, boosters and feed water heaters, we do not permit the engineer to take charge of a locomotive equipped with a booster until he is accompanied by a Road Foreman of Engines for at least one round trip or more, and a report is received from the Road Foreman that the engineer has been fully qualified to operate the device. The same method is carried out with firemen in regards to qualifying them on the operation of the locomotive stoker. At the present time we have equipped a locomotive with the exhaust steam injector and we will qualify our enginemen on this device similar to the manner in which we qualified them on stokers and boosters. We find that this educational work has been of great value, due to the fact that we do not have damaged boosters or stokers, due to the improper operation of the enginemen.

We continually keep instructing our firemen on fuel saving, having our Road Foremen and Assistant Road Foremen ride with the men regularly and keeping in close touch with the enginemen's duties.

We are continually adding a little day by day towards our educational work and we find the more we do of this educational work, the more efficient service we get from our men, which means a saving of money in the operation of our Railroad.

I have always been very much interested in Mr. Buell's papers that I have heard him read at different times and I am

sure that it has been a pleasure to me to hear him read his paper tonight.

PRESIDENT: We would like to hear from Mr. H. R. Horton, Mechanical Engineer, Pittsburgh Railways Co.

MR. H. R. HORTON: The Pittsburgh Railways Co. has started some special instruction work in this past year. We are trying to adopt the very thing Mr. Buell pointed out, of not trying to do too much along academic lines but sticking more to the practical end of it. We are trying to get men interested who are already in the service, not so much the apprentices, perhaps, as the older men; to get them interested enough to want further instruction along their particular lines. Of course, to get them interested, we can not invite them to come to arithmetic classes or to classes in electricity or mechanics, but we invite them to come and learn the equipment on the cars, the best methods of handling the cars, and the best methods of handling the equipment in order to get the best results from them. In that way we are trying to avoid any feeling of simply sending them to school, but rather make them more familiar with the various parts of the equipment and the best method of handling it.

PRESIDENT: Mr. W. J. Knox, Mechanical Engineer, B. R. & P. Ry.

MR. W. J. KNOX: I have listened to the paper with a great deal of pleasure. If I rightly caught the spirit of the program Mr. Buell is advocating, he wishes to get down to fundamentals to replace the more superficial methods which have heretofore been followed, to get the men and the supervisors together to make them both better fitted for thir jobs and to put new blood into the organization, and that is very much worthwhile.

The conditions surrounding the young men in the shops differ greatly from what they did some years ago. Years ago the older men in the shop, who were thorough mechanics and who knew best methods of working, took more interest in the apprentices and the boys went to them and were shown how to do work and many influences were exerted in their education that are not possible today because of intensive piece work and production methods, consequently the necessity for a more definite and systematic apprenticeship system. Mr. Buell will bear

me out that this is a fact. I can add nothing to what he has said, it is his business and he is a top notcher.

PRESIDENT: Mr. F. E. Cooper, shop Superintendent, Baltimore & Ohio Railroad.

MR. F. E. COOPER: I want to say that I have heard a good many papers on this subject, and I have never heard a better one than we have listened to tonight. The speech tonight recalls to me an incident a good many years ago when I was an apprentice boy on a certain railroad, and we were all invited up to the old Monongahela House, just as these boys have been invited here tonight, and Mr. Redding said to me, "Frank, I want you to make a speech tonight." I said, "I never made a speech in my life." "Well," he said, "you will make one tonight." I tried the best I could, and just got stuck the same way Mr. Gotch did tonight. So I have been interested in apprentice systems for a good many years. In fact, one of my first promotions was apprentice instructor. It is a very interesting work to watch the boys who are given a chance to learn the principal parts of the trade which they are attempting to learn. With the management behind the apprentice boys it gives them an incentive to make better use of it than if they were just shifting for themselves. They feel that they are being watched by the management.

Then some boys do not have an aptitude for the machinist's trade or the boiler maker's trade, or other of the shop crafts, and they naturally do not take much interest in their lessons. By this plan of Mr. Buell's, they are given a few months in which to make up back lessons, and if they do not, they are dropped. And this gives the other boys a glimpse of what will happen to them if they are not up with their lessons. And from my own experience in apprentice training—and I have had quite a bit of it—many of the boys who take that training have very good positions today, and there is no question that as the stile turns around the four years of the course, we will have a better class of men. Any foreman here who has handled men in the shop after Mr. McAdoo made mechanics over night, knows what it is to have a good man in the shop who can be depended on to follow up the work without standing over him.

PRESIDENT: The question is now before you for general discussion.

MR. SAMUEL LYNN: I do not want to be misunderstood—I am for education—it is essential in any line of work; however, I have spent considerable of my life and feel that I have had something to do with the maintenance of cars on the road with which I am connected. We have, as Mr. Kelly has already pointed out, an apprentice system and for years we have tried to get young men to come into our car shops and take up the regular apprenticeship training; however, in a car shop which is operated under a classified system and the employes compensated on a piece work basis, there does not seem to be any desire on the part of the boys or young men seeking employment to enter the service under an apprenticeship system. Invariably their answer was that they would think it over and come back and let the supervising officers know, and in most every case the applicant would not return. This, I have attributed to the fact that there does not seem to be sufficient inducement under our present system of handling our car department work for the apprentice to spend four years as an apprentice in the car department. As I have already stated, we specialize in the work in that department and the young man who did go into the shop on an apprentice system, would soon learn that there were a number of men in the shop who had not taken the apprenticeship course but had specialized in that particular branch of the work, and under a piece work compensation basis were making more money than the apprentice could expect to earn as an apprentice during his whole four-year course, and the young men who had started out as apprentices would go to their supervising officer after they had been in the shop for only a few months and request that they be given work at some one operation in the shop, the same as other men employed on a piece work basis, so they could earn more money and they would invariably state that they could not see any necessity for them spending four years of their time in various departments of car department operation in order to become thorough mechanics when other men could, in a few months' time earn as much or more money as the man who had spent four years' apprenticeship was earning. We have tried to point out that the workmen they were referring to were not thorough mechanics and were only trained for one operation, and in order to get sufficient men to carry on our work, particularly in large industrial centers such as the Pittsburgh district, where there is a large foreign element, it was necessary that the men be made proficient in one branch of the

work as quickly as possible. However, the condition as outlined, has removed the incentive for young men taking up the apprentice course in the car department branch of railroad service and notwithstanding that they have been informed that if they went through the regular prescribed course, their prospects for advancement into supervising positions were much better than the average workman on specialized work, the young men could not be induced to take up the regular apprenticeship course, as they invariably put up the argument that insofar as the car building work was concerned, not only in the railroad shops, but in the car building plants, each operation was performed by a specialized gang and in a large number of instances, all of the work was done by men of foreign birth and they were trained to the specialized system and assigned to a particular operation during the erection of a car and under a system of this kind their work could be learned in a very short time.

As I have said, while we do not get regular apprentices, it is our practice to start younger men in as laborers, helpers, material carriers, etc., and as they become familiar with the different operations in the shop, the younger men are not employed in the shop any great length of time before they have picked up sufficient knowledge that they feel they are in a position to advance to one of the gangs doing specialized work, where they can make more money, and as the necessity arises, we usually advance the younger men to the different branches of our car shop work. This not only applies to the various departments in the shop, but also to our supervising forces.

However, I would like to hear Mr. Buell's views and also have him tell us what experience he has had with the apprentice system in the car department branch of railroad work.

It is my opinion that due to the fact that we do not get boys who go through the course and learn every operation of the car game, we should have some method whereby we could take our younger men and instruct them so that they would be able to read blueprints and from them lay out different parts of a car, and if necessary, construct the entire car. In other words, what I have in mind would be a system whereby the employes now engaged in car work desiring to improve their knowledge would have an opportunity for doing so and would like to know whether Mr. Buell has had any experience along this line from a car department standpoint, and whether or not the system was beneficial, not only to the men themselves, but

also to the railroad who provided the extra training in the way of getting more efficient men and educating men so they would be better qualified to handle positions of a supervisory capacity.

MR. WILDIN: I was interested in the ratio of apprentices mentioned by Mr. Buell. It is a matter of general agreement that there may be a ratio of one apprentice to every five mechanics? I understood Mr. Buell to say that they were only able to secure a less per cent in the shop. I would like to have him make that statement again.

The President announced that he wished to catch a train and would ask Mr. Conway to preside for the remainder of the meeting.

MR. CONWAY in the Chair: Volunteers do not seem to be responding very freely. We have four past presidents with us tonight, which is a rather unusual thing. I am going to call on one of them, Mr. Spielmann.

MR. J. A. SPIELMANN: Mr. Buell's paper is very interesting and contains much food for thought.

I am very proud of the B. & O. apprentices present and I feel there is among them at least one future Railroad President. I think one of the essentials for improving the quality of the supervising forces on the Railroad is to put better men in at the bottom.

If you consider the difficulty we had 35 or 40 years ago in starting men in the Railroad service, you will readily appreciate the splendid facilities and opportunity that now exists for training young men for Railroad service.

I believe we have on the Baltimore and Ohio a very good system for the training of Apprentices.

CHAIRMAN: May we hear from Mr. W. H. Altsman, Mechanical Engineer, P. H. & B. and N. C. Railroad.

MR. W. H. ALTSMAN: I enjoyed the paper very much, and I believe I corroborate Mr. Lynn's statement on the car-building end of it. I do not think I can add anything to the paper of Mr. Buell. I also would like to hear something more along the line of Mr. Lynn's question.

CHAIRMAN: I am going to call on Mr. Fullerton, identified with the apprentice work of the B. & O.

MR. C. N. FULLERTON: First, I want to thank the

Pittsburgh Railway Club for their kind hospitality, in inviting me to attend the meeting this evening. I, too, have enjoyed Mr. Buell's paper very much indeed, particularly so because of the fact that the subject of his remarks this evening, as it relates to apprentice training, is not a theory, at least on the Baltimore & Ohio, for it has been in practical operation on this railroad for the past fifteen months. Prior to the early part of 1922 the B. & O. had class room apprentice instruction at eleven of the larger points. This class room instruction, while better than none at all, failed to reach all the apprentices at all of the stations where apprentices were employed. There was little coordination as between the several schools, each apprentice school being largely left to the initiative of the individual apprentice instructor in charge. Again, there were no particular requirements of the apprentices and there was no method of judging the progress of the individual apprentices, rather, the progress being measured by the progress of the class as a whole. This class room method of apprentice training was expensive, when the time of the apprentices away from their work was considered, and the railroad decided to discontinue this method of training in the early part of 1922. In the latter part of this same year, the shop craft organizations on the Baltimore and Ohio, recognizing the need for apprentice training, requested the Management of the railroad to provide some sort of training for the apprentices. Mr. G. H. Emerson, Chief of Motive Power, was very much interested in apprentice training, and said that perhaps some other method of training apprentices would be better than the old methods formerly followed, and suggested the appointment of a committee to make a survey for the purpose of determining the best possible methods of apprentice training, having in mind the particular needs of the apprentices in the mechanical department of the Baltimore & Ohio. As a result, this committee was appointed, two members of the committee representing the Management and two representing the employes. This committee made a very exhaustive survey of practically all methods of apprentice training and submitted a recommendation to Mr. Emerson, that the Railway Educational Bureau of Ohama, be selected to collaborate with the Baltimore & Ohio, in providing technical training for the apprentices. This recommendation was adopted and in September, 1926, our present apprentice training methods were started on the Baltimore & Ohio, and to say the least, it has exceeded

the expectations of everyone, in the results accomplished since that time.

This technical training consists of home study work on the part of the apprentices entirely, no class room work being necessary nor required, thus assuring that the apprentice does not spend any productive hours in class room study, and the railroad thereby receives the benefit of the time formerly amounting to four hours per week per apprentice that the apprentices lost while engaged in class room study. This training is divided along two general lines, one, mechanical drawing, and the other general instructions, which includes mathematics and technical instructions applicable to the particular craft the apprentice is in, this technical training being applicable to the eleven different trades, each apprentice receiving the technical instruction pertaining to his own trade. In this way we reach not only the apprentice in the locomotive department, but the car department as well, each apprentice specializing in his trade, such as machinist, boilermaker, blacksmith, pipe-fitter, sheet metal worker, electrician, carman, painter, upholsterer, pattern-maker and molder. Some of the things we have experienced as a result of this method of technical training are very interesting. I do not want to unduly burden you with details of what we are doing, but I cannot refrain from telling you just a few instances of the human interest stories of what we are doing among the apprentices as a result of the methods we are following. This technical training is furnished to the apprentices by the railroad without cost to the apprentices. The training is supervised by a staff officer on the staff of the Chief of Motive Power. The training is compulsory and each apprentice is required to get in two lessons each month or he is not retained in service as an apprentice. There are three traveling apprentice instructors, who visit each station at least once each month, and the larger stations oftener, as may be necessary. In this way we establish a personal contact with each apprentice, the traveling apprentice instructor seeing the delinquent apprentices at each station and encouraging or assisting them as may be necessary. In this way we are really doing a worthwhile work in developing apprentices, who perhaps without this personal contact would fail to assimilate the training.

For instance, one case that I particularly have in mind, is the case of an Italian apprentice in the car department at Locust Point, Baltimore. This man is married and is in his thirties, has had only three years of school in Italy and one year in

night school in this country to learn the English language. When this training was started, he was fearful that he could not get the lessons and told the apprentice instructor that he might as well resign. The apprentice instructor told him that if he would apply himself, and study hard, that he could get the lessons and need not resign, and further told the apprentice that he (the apprentice instructor) was willing to help him in every way he could. As a result of that sort of encouragement and assistance of the apprentice instructor this apprentice has been able to successfully carry on the training work and is and has been continuously on schedule. This case illustrates aptly what can be accomplished through effort on the part of the individual with the assistance of the apprentice instructor. Another case that came under my personal observation was an apprentice at Chillicothe, Ohio, who became delinquent, and when I talked with the boy about his delinquency, he told me that his home environments were bad, that his father did not believe in education and would not permit him to burn electric light at home to study by and that as a result he could not get his lessons. The apprentice was discouraged and wanted to resign, but I told him that I was sure that we could make arrangements for him to study at the shop after working hours. The Master Mechanic was only too glad to provide a corner of the office where the apprentice could study and do his lessons after working hours, and we save this apprentice in this way.

Then again, at Brunswick, Md., the General Foreman told me of an incident, where an apprentice had helped him out of a difficult situation, by making a drawing of Brunswick yards for him, when no draftsman was available. This yard is a double hump yard seven miles long and is a rather intricate drawing for an apprentice to show the complete yard lay-out, but the apprentice was equal to the occasion and made a very fine drawing. The General Foreman was delighted and all the more so, by reason of having to get the drawing made and having no draftsman at the point. The apprentices are frequently called on at the several points to make sketches and drawings of broken parts in the absence of a draftsman at the point.

These apprentices, during the short period of fifteen months have assimilated this technical training splendidly and are showing real ability to perform their work much better than they would if no technical training had been given them. Just recently we had a clear demonstration of this, when, during a reduction of forces, some of the older employes were unable to

satisfactorily pass the car inspectors' examination and although their seniority would have permitted their taking these jobs, they were unable to do so, with the result that some of our apprentices, who were much junior to them, did pass the car inspectors' examination and were retained in service.

One feature of this training that is interesting is the compulsory feature of the training given the apprentices. This compulsory feature has been agreed to by the shop craft organizations and incorporated in their agreement, and provides that an apprentice failing to maintain his lesson schedule of two lessons each month and becoming three months delinquent, is not retained as an apprentice. As a direct result we have been able to maintain an average of 75% of all the aprpentices being on schedule each month since the training started. We have also enjoyed the very hearty co-operation of the shop craft organizations in keeping after the apprentices who are even delinquent for one or two months. Just yesterday, as an example of this, I visited Glenwood shop here in Pittsburgh, and the chairman of the machinists' committee asked me how the apprentices were getting along and told me of his efforts with the apprentices to see that they sent in their lessons. We have likewise had the full co-operation of the local officers at every point in keeping behind the apprentices to keep up their lessons. They are always eager to help out, and recognize the fact that these apprentices are receiving a very splendid training.

I am delighted to see here tonight, such a splendid representation of the Baltimore & Ohio apprentices, and I am sure that they agree with me that the results we have obtained during the past fifteen months on the Baltimore & Ohio have been very gratifying, and that we can truthfully say that Mr. Buell's remarks tonight, are no longer a theory, but a practical fact.

MR. SAMUEL LYNN: I was very much interested in that employe of the car department who I understood was over thirty years old. Was he really an apprentice or are you paying him journeyman's wages and trying to educate him while he is qualifying for the job?

MR. FULLERTON: The training in the car department is the same as in the locomotive department, the apprentices receiving training along their own craft lines. There are two classes of apprentices, namely regular and helper apprentices. The regular apprentices serve four years, while the helper apprentices serve three years after having workd as helper in the

shop for two years previous to going on as an apprentice. The apprentices I spoke of, who were able to take the car inspectors' jobs, did so because of their ability to pass the car inspectors' examination, after having completed their apprenticeship and having had this training during their term of apprenticeship, which enabled them to pass the examination satisfactorily.

CHAIRMAN: I would like to call on Mr. J. J. Herlihy, of the B. & O.

MR. J. J. HERLIHY: I was a member of the Pittsburgh Railway Club during the war period, at that time being assigned to the position of Assistant Master Mechanic of the Pittsburgh Division, Baltimore and Ohio Railroad Company. In September, 1919, I was transferred to the Western Lines, spending most of the time hence as Master Mechanic of the St. Louis Division, having recently been transferred back to the Pittsburgh Division in the position of Division Master Mechanic.

I have served in the Supervisory capacity since 1907 or for the past 20 years and am rather familiar with some of the early Apprentice schools, which have been spoken of at this meeting. At various points on our Railroad we did have Apprentice Schools; at some of the larger points, we had regular Apprentice School teachers and at other points, the Draughtsman was used as teacher during the school hours; while at many other stations, known as the smaller stations, the Apprentice received no consideration in the way of schooling while serving their apprenticeship, with the exception that at some smaller point, we did have an arrangement whereby an Apprentice would be transferred for a short period of time, during the latter portion of his Apprenticeship, to a larger station, in order to get a broader and more varied experience of the work, and during this period, some of the boys from the smaller points, would get a very short period of Apprentice school training, but generally speaking, the boy at the smaller station received no consideration whatever in apprentice schooling, and it has been my experience at the larger points, the points where we did have Apprentice schools, that during the period of school, it would be necessary to take the Apprentice boy off the machine that he might be operating, and which would stop the output of that machine during the school period; we also had boys working on floor work and bench work, which work would also naturally be stopped and delayed during the period of the school hours, and the information that a great deal of our Apprentices got

from the Apprentice School that we had in those days, in my experience was not very much.

Since we have started the present Apprentice arrangement on the Baltimore and Ohio Railroad Company, through the Railway Educational Bureau at Omaha, Neb., our Apprentice boys, regardless of the location or number of Apprentice boys employed, receive the same consideration and a noted improvement is observed in the apprentice boys in the past 12 or 15 months during which time they have been given this training; they seem to be generally more interested in their work. You cannot go to the shop now and ask a boy a question in mathematics, but that we are pretty near sure of receiving proper information covering the question asked.

At the time this Apprentice training was started, I was on the St. Louis Division and we did have some little trouble with some of the Apprentices who had not received very much education before starting in on their apprenticeship, though we did have examination that an Apprentice was supposed to be able to pass before he started as an Apprentice, and in order to get the boys started properly, I had all of the Apprentice boys in my office and they advised me that some of the lessons were pretty hard, I said allright, we have Supervisors in every capacity in this shop; these Supervisors are at your disposal; we know you are supposed to get these lessons at home, but if there is anything that you do not know about the lessons, that you cannot get at home, bring them down here to the shop, talk to your Foreman about it; if your Foreman cannot help you, you have at your disposal my entire office force, which I know will be able to help you and if our Clerical force cannot help you out, we have right in connection with this building, a Division Accountant's office where you can secure all kind of information; all we want you to do is to take an interest in this training, and I found of the number of Apprentice boys we had in that large shop at that time, we did not have to take any of the Apprentice boys out of service for any reason relative to getting lessons; we had boys working that were 15 and 18 lessons ahead at all times, and knowing the previous methods we used in educating our Apprentice boys, and from the period of time we had been handling Apprentices with the present method of education, I feel that it is a big improvement over anything that we have ever undertaken and feel that when an Apprentice boy goes out on his time on the Baltimore and

Ohio, we feel that he will be able to fill practically any position you might want to use him on.

At the present time, we can call practically any of our Apprentice boys in to make sketches of broken parts or any sketch that we might want made around our shops and in practically all cases, we get sketches well made, which shows interest on the part of the boy making same and speaks well for the Railway Educational Bureau.

CHAIRMAN: If there is no further discussion I will ask Mr. Buell to answer the questions and close the discussion.

MR. BUELL: Many roads have had trouble in attracting sufficient apprentices to supply the needs of the car department as well as one or two other departments. Such roads have had more difficulty at industrial centers such as Pittsburgh than at points where there is less industrial competition.

With a proper system of apprentice training advertised in the schools and throughout the local community, there is no difficulty in maintaining a waiting list of applicants for apprentice jobs for all crafts.

Many of the boys on such a waiting list will have had at least two years of high school training. There will be a number of high school graduates and a few boys who have had polytechnic or other advanced work.

I am not theorizing on this. The last time I ran through the examination papers of applicants on the Baltimore & Ohio waiting list, there were 53 applications on file from high school graduates or polytechnic students. These applications included boys desirous of entering the car department, the boiler shop, and some of the other trades classed as difficult to fill.

May I speak frankly about this matter? You will not have applications of this kind nor a waiting list unless it is known in the community that apprentice boys in your shop are under proper discipline, are carefully supervised, and are being given real constructive training. You cannot kid a boy very long. Nor can you expect to attract good boys who are ambittious to become craftsmen unless they know that you offer them a real opportunity to accomplish their desired purpose.

Just as an example of what happens: There is a small town in Louisiana, on the Missouri Pacific, where the Superintendent of Schools came to one of the Missouri Pacific Apprentice Instructors and said, "Do you realize what you have done in this town? There are fifteen boys in this town who left

school and have been running around loose, who have come back to school in the last three months because of the apprentice training plan in effect on your railroad. None of these boys ever worked for your railroad, but this is a railroad town and these boys now realize that they cannot get jobs on the Missouri Pacific unless they have sufficient schooling to pass the required apprentice examinations. They have come back to school so that in case they want to go to work for the railroad, they will have sufficient education to pass the entrance requirements."

The agreed ratio of apprentices to mechanics varies from 1 to 3 to as high as 1 to 7. Ratios as high as 1 to 10 have been considered. The most common ratio is 1 to 5. Most agreements provide for 50 per cent helper apprentices and 50 per cent regular apprentices. Helper apprentices serve three years and regular apprentices four years.

The ratio of apprentices should be a function of the labor turnover of mechanics; that is, the number of apprentices graduating each year in each craft should closely approximate the number of mechanics of the corresponding craft leaving the service for all causes.

MR. WILDIN: I do not believe you get my point. The number of apprentices will vary at different places and in different years. I thought you cited a certain railroad as having an agreement of one to five.

MR. BUELL: Yes.

MR. WILDIN: And when it was checked up they had only 40 per cent of the number they could take on.

MR. BUELL: I used a hypothetical case. If you employ 1000 mechanics a ratio of 1 to 5 would allow you 200 apprentices. If you use only 150 apprentices you are losing 50 times $700—that is, $35,000 a year. I could have given you an actual case from some of our surveys that is very close to this figure.

Concerning the point about young men finding their proper work. You gentlemen realize that after an apprentice passes his probation period, he usually holds his job until he graduates. There has been no systematic method of eliminating apprentices that were not adapted to learn craft work. This new system has been a godsend to such boys. The system systematically eliminates them from the service. Instead of wasting four years of their life as an apprentice when they should be in some

other kind of work, they are quickly eliminated if they do not adapt themselves to craft training. You do not waste four years of the boy's time and of the railroad's time. It is much better for the boy to be eliminated from shop work than to waste four years of his time in trying to teach him a trade that he is temperamentally unfitted to follow.

Just one more word. I hoped this discussion would center on the training of supervisors.

I can remember when as a fireman I was called into the office of the Superintendent of Motive Power and shown a circular stating that I was appointed traveling fireman. I was told, "You know those fellows, you have been working with them, go out and do the best you can with that bunch." This was all I was told when I made the transition from employe to minor supervisor.

I venture to say that the great majority of you gentlemen can go back in your own experience to a similar situation. This is fundamentally wrong. When a man makes the transition from employe to supervisor, no matter how minor a position he may be given, he should be instructed in the fundamentals of supervision.

If you have a foreman in your organization who has no idea about planning his work, no ability to analyze conditions, one who is just jumping around trying to do it all himself, one who does not know how to organize men under him so that each man carries his own share of responsibility, how can you expect to get results?

The great problem on our railroads today is to train supervisors in a thorough understanding of the fundamentals underlying their work. Unless supervisors are trained so that they understand the policies of the officers of the Company, the fundamentals of modern management, the proper handling and disciplining of men, and the application of ordinary business common-sense to their problems, we have no right to expect that our transportation machine will function smoothly.

If any of you doubt the truth of these assertions, I suggest that you try an experiment. Select five of your foremen or supervisors at random. Ask each one of them to give you a brief, concise statement of the five most important duties in connection with his work, what he considers the real purpose of his job, and the most desirable end that he is supposed to accomplish. You may be surprised to find that some of your supervisors have no clear conception of the real purpose of their

job, that they have never crystallized into thoughts or words the fundamental principles underlying their work. May I add a friendly word of warning in case you decide to make such a test? Think out the answer the foreman should give you before you ask the question. It may avoid embarrassment should he frankly say that he did not know, but would like to have you explain the matter to him.

MR. SPIELMANN: Has Mr. Buell made any studies of other departments than the mechanical?

MR. BUELL: Yes, sir. I am an operating man myself. It is a fundamental problem and you can analyze it just the same as any other problem. I used the fuel proposition because we never got anywhere on fuel economy until it was properly analyzed. You begin to get somewhere when the chief operating officer calls attention to the fact that there is a fuel campaign on and they are going to save some fuel, and he keeps after it. This whole educational proposition has to be considered as an operating problem and analyzed. If you have a problem with your section foreman you can analyze it in just the same way, or with your track men or your station agents or any other group. Each is susceptible of the same analysis. The difficulties that have been apparent have been a lack of texts, a lack of guidance, and a lack of the realization that it is not a college problem but that it is an operating problem. Today there are texts available and practical training methods have been worked out. Any executive who realizes the possibilities—the potential economies involved, can begin the planning of a comprehensive program that is susceptible to dollar-and-cents analysis the same as any other operating problem.

CHAIRMAN: I am going to call on one of our past presidents who has favored us with his presence tonight, and who is well known to most of you, Mr. J. G. Code.

MR. J. G. CODE: I have no intention of discussing Mr. Buell's paper. He mentioned one very interesting fact to me which relates back to my own experience, in that there are now available pracical text books which a railroad man of any capacity who wants to learn may have access to for the purpose of improving his knowledge. For some of us who have been in the service 45 to 47 years or more, there was no such thing. I entered the railroad service with very limited education and no training but with a desire to learn. All we got from the super-

vising officer was, "You do what I tell you and don't ask questions." I tried to get books that might help me. When I saw a book that looked interesting I got it, and generally got in over my head in mathematics before I got through six pages. There is opportunity now for a man of ordinary education to apply himself and learn and advance. We want to get back to the actual meaning of the word education, to draw out. Instead of understanding education to be putting a lot of facts in an empty head, draw out the native ability that is in the man. We have men in Pittsburgh today who have the capacity to advance if given the right kind of training and opportunity. I sympathize with my friend, Donald Moore, when he speaks about these suggestions not being confined to the shop wholly. I would not minimize the importance of training in the shop, but it is equally needed in all the other departments.

When I left home yesterday solely for the purpose of attending this meeting I felt that I was making a very considerable effort. I have been amply repaid and more than repaid in hearing Mr. Buell's paper and the discussion which has followed it.

CHAIRMAN: It has been very gratifying tonight, and it must be to Mr. Buell also, to have the attendance we have and to see the earnestness shown in this discussion. And we are all more than delighted to have with us these young men of the class from the B. & O. That is something this club can fully appreciate. And we extend to these boys an invitation not to make this their last visit, for the door is always open and we believe you will be repaid to attend our meetings at any time you can make it convenient.

I will take this opportunity to extend to Mr. Buell the very sincere and hearty thanks of the Railway Club of Pittsburgh for his most interesting and instructive paper.

There being no further business, upon motion, meeting adjourned.

J. D. CONWAY, Secretary.

In Memoriam

D. J. REDDING,

Died, December 8, 1927

OFFICIAL PROCEEDINGS

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THE DISPATCHER CONTROLLED SIGNAL SYSTEM FOR TRAIN OPERATION

By W. B. RUDD, Engineer, Union Switch & Signal Company, Swissvale, Pa.

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Meetings held fourth Thursday of each month except June, July and August.

PROCEEDINGS OF MEETING
JANUARY 26, 1928

The meeting was called to order at the Fort Pitt Hotel, Pittsburgh, Pa., at 8:00 o'clock P. M., with Vice-President W. S. McAbee in the chair.

The following gentlemen registered:

MEMBERS

Allan, W. J.
Altsman, W. H.
Ashton, William A.
Ball, Fred M.
Balzer, C. E.
Barclay, J. R.
Beam, E. J.
Berghane, A. L.
Biggard, W. J.
Blackmore, G. A.
Bowen, J. T.
Bradley, W. C.
Brewer, H. W.
Brice, J. A.
Brown, F. M.
Cairns, J. H.
Campbell, C. A.
Champion, James H.
Cipro, Thomas
Conway, J. D.
Corcoran, James
Cotter, George L.
Courtney, H.
Cunningham, R. I.
Dalzell, W. E.
Dambach, C. O.
Davis, Charles S.
Dennis, J. G.
Diven, J. B.
Eagan, D. F.
Edwards, C. H.
Emery, C. W.
Emery, E.
En Dean, J. F.
Falkner, A. J.
Fike, James W.
Fisher, Harry G.
Fletcher, Albert
Follett, W. F.
Frauenheim, A. M.
Fults, J. H.
Furch, G. J.
Geddis, D. Y.
Geikler, J. A.
Glenn, J. H.
Goda, P. H.
Goff, J. P.
Gordon, George A.
Greene, W. F.
Haller, Jacob
Hanna, R. B.
Hansen, William C.
Harris, Francis C.
Harris, John P.
Hastings, Walter S.
Hill, R. W.
Holmes, E. H.
Hoover, J. W.
Hunter, Bernard E.
Irwin, R. D.
Jones, R. T.
Karns, C. A.
Keefe, E. A.
Kellenberger, K. E.
Kelly, H. B.
Kelly, J. P.
Ketterer, F. P.
Klassen, F. G.
Knapp, A. D.
Lanahan, J. S.
Lawson, Rowland R.
Leckey, Ralph H.
Leonard, C. W.
Lewis, John H.
Lobez, P. L.
Loeffler, George O.
Long, R. M.
Ludgate, B. A.
Lynn, Samuel
Maliphant, C. W.

Marshall, C. W.
Miller, J.
Mitchell, F. K.
Mitchell, W. S.
Mogan, John M.
Moses, G. L.
Myers, G. H.
McAbee, W. S.
McConnell, C. H.
McGeorge, H. W.
McInerney, M. G.
McLaughlin, H. B.
McNeill, J. E.
McNelty, A. P.
Nelson, R. F.
Nelson, W. M.
Ness, H. S.
O'Connor, C. D.
O'Connor, M. J.
Orchard, Charles
Painter, Joseph
Passmore, H. E.
Pickard, S. B.
Prince, Albert
Provost, S. W.
Rauschart, E. A.
Raymer, I. S.
Reddick, Warren E.
Redding, J. H.
Redding, P. E.
Reeve, George
Richardson, H. A.
Richardson, H. R.
Rodda, G. A.
Roney, H. E.
Rowland, F. S.
Rudd, W. B.
Sattley, E. C.
Sayre, F. N.
Schaacke, William
Sharp, H. W.
Sheedy, J. A.
Shellenbarger, H. M.
Sheridan, T. F.
Showalter, Joseph
Snyder, F. I.
Spinning, Charles F.
Stevens, R. R.
Stoehr, Arthur L.
Stokes, A. H.
Stucki, A.
Sutherland, Lloyd
Sylvester, H. G.
Thiele, Fred
Thompson, F. J.
Tracy, T. W.
Tucker, J. L.
Van Blarcom, W. C.
Van Ryn, William
Van Wormer, G. M.
Warner, R. H.
Warren, A. T.
Wheatley, William
White, A. B.
White, C. G.
White, R. H.
Whitlock, C. E.
Wilcox, H. C.
Wilson, George F.
Winslow, S. H.
Wood, John H.
Wright, John B.
Wright, O. L.
Young, F. C.
Zentgraf, Henry

VISITORS

Acheson, W. C.
Adams, W. J.
Anderson, Burt T.
Anderson, George E.
Behner, L.
Bell, Charles W.
Bier, Edward C.
Blead, W. R.
Brooks, Earl B.
Brown, Homer
Byrom, Clyde
Carpenter, L. E.
Church, S. L.
Clifford, C. M.
Collins, Jerome B.
Crawford, A. M.
Dalzell, C. W.
Davis, William B.
Day, T. R.
Dean, W. A.
Dermot, Phil
Dignam, James

Doam, Robert E.
Downes, D. F.
Dunham, C. W.
Eagan, John O.
Harwig, C. G.
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Hays, J. B.
Heimbach, A. E.
Hill, G. W.
Hixon, C. W.
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Janer, J. D.
Janis, G. L.
Johnson, George H.
Jory, S.
Krylow, J. E.
Lenzinger, W. M.
Lewis, S. B.
Lipp, S. K.
Loomis, H. S.
Loucks, D. W.
Loucks, J. L.
Lutz, Harry
Maloney, J. J.
Marshall, J. J.
Miller, John
Miller, W. C.
McCarthy, John S.
McCreary, O. L.
O'Neill, Fred C.
Paisley, F. R.
Parker, Lou A.
Post, W. M.
Provost, W. J.
Pry, E. B.
Rainey, P. A.
Reese, N. S.
Riegler, L. J.
Ritterbush, L. C.
Rothrock, J. G.
Rudd, A. H.
Schmitt, G. A.
Schultz, George H.
Seitz, W. W.
Semethy, Joseph J.
Shaddock, C. E.
Sixsmith, G. M.
Smith, Sion B.
Spangler, W. N.
Stanton, H. L.
Steward, J. E.
Suydan, J. A.
Tasker, A. H.
Thomas, Charles B.
Thompson, D. D.
Thoseman, C. G.
Valentine, Harvey
Walker, Thomas M.
Walton, H. R.
Wheeler, C. M.
Willby, N. H.
Wilson, J. E.
Wolcott, H. E.
Yelland, John L.
Zugan, John D.

The call of the roll was dispensed with, the record of attendance being obtained through the registration cards.

The reading of the minutes of the last meeting was dispensed with as they have appeared in printed form and been distributed to the members.

The Secretary read the following list of applications for membership:

Acheson, Walter C., Train dispatcher, A. & S. R. R. Co., Glenwillard, Pa. Recommended by W. C. Van Blarcom.

Bates, H. W., Manager of Sales, Pittsburgh District, Pittsburgh Testing Laboratory, P. O. Box 1115, Pittsburgh, Pa. Recommended by A. R. Ellis.

Benson, G. W., Chief Clerk to Division Engineer, B. R. & P. Ry., 413 West Du Bois Avenue, Du Bois, Pa. Recommended by E. J. Devans.

Bier, Edward C., Yard Master, Mon. Con. R. R., 117 Duffland Avenue, Mt. Oliver Station, Pittsburgh, Pa. Recommended by C. W. Emery.

Borchers, E. A., Chief Draftsman, Bridge Department, Pennsylvania Railroad, 500 Peebles Street, Pittsburgh, Pa. Recommended by M. J. O'Connor.

Brewer, H. W., Supt. of Shops, B. R. & P. Ry. Co., Du Bois, Pa. Recommended by E. J. Devans.

Brogan, J. E., Passenger Conductor, B. R. & P. Ry. Co., 397 East Utica Street, Buffalo, N. Y. Recommended by E. J. Devans.

Campbell, C. A., Agent, B. R. & P. Ry., 509 East Moody Avenue, New Castle, Pa. Recommended by E. J. Devans.

Dugan, Arthur N., Vice-President, National Bearing Metals Corporation, 30 Church Street, New York, N. Y. Recommended by E. J. Devans.

Dunbar, Charles L., Conductor, P. H. B. & N. C. Ry., 514 South Washington Street, Butler, Pa. Recommended by A. T. Warren.

Faessel, Joseph, Jr., Clerk, B. R. & P. Ry., 1230 Sheffield Street, N. S., Pittsburgh, Pa. Recommended by E. J. Devans.

Fisher, Harry G., Clerk, B. R. & P. Ry., 2455 Wenzel Avenue, Pittsburgh, Pa. Recommended by E. J. Devans.

Flynn, E. E., Publicity Department, Westinghouse Air Brake Company, 353 Marguerite Avenue, Wilmerding, Pa. Recommended by G. L. Cotter.

Gorman, P. F., Passenger Conductor, B. R. & P. Ry., 139 Greenfield Street, Buffalo, N. Y. Recommended by E. J. Devans.

Gotch, Fred K., Machinist, B. & O. R. R. Co., 5110 Lytle Street, Pittsburgh, Pa. Recommended by E. J. Devans.

Green, E. C., R. F. of E., B. R. & P. Ry., Punxsutawney, Pa. Recommended by A. H. Stokes.

Lawson, Rowland R., Clerk, B. R. & P. Ry., 2955 Merwyn Avenue, Corliss Station, Pittsburgh, Pa. Recommended by E. J. Devans.

Maley, W. E., Supervisor Bridges & Buildings, B. R. & P. Ry., 115 Grant Street, Du Bois, Pa. Recommended by E. J. Devans.

Marquis, George E., Train Master, P. & L. E. R. R., 702 Sixth Avenue, New Brighton, Pa. Recommended by J. P. Goff.

Morrow, Wilson, Division Engineer, B. R. & P. Ry., 113 West Du Bois Avenue, Du Bois, Pa. Recommended by E. J. Devans.

Moulis, F. J., Cashier, B. R. & P. Ry., 1222 Voskamp Street, N. S., Pittsburgh, Pa. Recommended by E. J. Devans.

McCabe, James F., Train Dispatcher, P. & L. E. R. R., 905 Federal Street, N. S., Pittsburgh, Pa. Recommended by A. P. Reckley.

McFeeley, M. J., Traveling Car Agent, B. R. & P. Ry., Ridgway, Pa. Recommended by E. J. Devans.

Person, G. H., Signal Supervisor, B. R. & P. Ry., 209 Spring Avenue, Du Bois, Pa. Recommended by E. J. Devans.

Roan, Harry B., Foreman of Locomotive & Crane Repairs, Jones & Laughlin Steel Corporation, 658 Franklin Avenue, Woodlawn, Pa. Recommended by Joseph Showalter.

Rowland, F. S., Locomotive Engineer, B. R. & P. Ry., 14 Rumbarger Avenue, Du Bois, Pa. Recommended by E. J. Devans.

Schultz, George H., Coal Agent, Pennsylvania Railroad, 722 Pennsylvania Station, Pittsburgh, Pa. Recommended by E. Emery.

Semethy, Joseph J., Asst. Foreman Tool & Die Department, Westinghouse Air Brake Co., Forest Hills, Wilkinsburg, Pa. Recommended by P. W. Dempsey.

Shaw, John, Road Master, B. R. & P. Ry., 404 Indiana Street, Punxsutawney, Pa. Recommended by E. J. Devans.

Sidey, W. J., Division Storekeeper, B. R. & P. Ry., 132 South Brady Street, Du Bois, Pa. Recommended by E. J. Devans.

Smith, H. H., Assistant Traffic Manager, American Sheet & Tin Plate Company, Frick Building, Pittsburgh, Pa. Recommended by Charles Orchard.

Souders, W. J., Route Agent, American Railway Express Company, 144 West Long Avenue, Du Bois, Pa. Recommended by E. J. Devans.

Taylor, E. P., Conductor, B. R. & P. Ry., 235 Front Street, Punxsutawney, Pa. Recommended by A. T. Warren.

Thompson, F. J., Terminal Superintendent, B. R. & P. Ry., 221 East Lincoln Avenue, New Castle, Pa. Recommended by E. J. Devans.

Wheeler, Charles M., Sales Engineer, Union Switch & Signal Company, 509 California Avenue, Avalon, Pa. Recommended by James W. Fike.

Wolford, Jesse J., Foreman, B. R. & P. Ry., 2211 Rockledge Street, N. S., Pittsburgh, Pa. Recommended by E. J. Devans.

Woodbridge, H. C., Canadian Representative, Locomotive Stoker Company, 245 Rugby Avenue, Rochester, N. Y. Recommended by E. J. Devans.

Yelland, John J., Train Dispatcher, A. & S. R. R., 609 Owens Street, Woodlawn, Pa. Recommended by C. D. O'Connor.

Zentgraf, Henry, Asst. Chief Clerk, B. R. & P. Ry., 11 Mt. Troy Road, N. S., Pittsburgh, Pa. Recommended by E. J. Devans.

VICE-PRESIDENT McABEE: These applications will be referred to the Executive Committee in due course, and upon approval by them, the gentlemen will become members without further action.

Is there any further business? If not, we will proceed to the paper of the evening. I am not personally acquainted with Mr. Rudd so I have no eulogy to make for him at all, other than to say that coming from the pioneer signal company which he represents, he ought to give you the latest there is. If my recollection serves me rightly a representative closely related to the speaker of the evening told a body of railroad men some five or six years ago here that the signal and the signal system that is coming into vogue today was going to come to all, whether they liked it or not, and I think Mr. Rudd will show you some pictures tonight that will be worthy of your favorable consideration.

THE DISPATCHER CONTROLLED SIGNAL SYSTEM FOR TRAIN OPERATION

By W. B. RUDD,
Engineer, Union Switch & Signal Company, Swissvale, Pa.

Mr. President, Members of The Railway Club of Pittsburgh and Guests: I am very glad that the President could

not give any eulogy of me, because as a rule a eulogy is given for a dead one, and I would not want to start off that way.

About two years ago Mr. H. M. Sperry of New York gave an address before this club on the subject of "Train Operation by Signal Indication," and as a sort of preliminary to the paper of this evening I would like to quote two paragraphs from Mr. Sperry's address, paragraphs which give the basic facts of train operation by train orders and train operation by signal indication.

"Train orders are written instructions and must be delivered to the conductor and engineman of the train. They must be correctly prepared, carefully transmitted and faithfully delivered. Above all, they must be uniformly understood by all concerned and must not be forgotten. On railroads not equipped with block signals, safety of operation depends entirely upon the human element. There is no check by a block signal against an improper train movement should an error or failure occur in the preparation or delivery of the order, or should the order be misunderstood or forgotten."

"Signal indications are instructions given by the aspects of fixed wayside signals. Instructions given by signal indications require less effort in preparation and transmittal than do written instructions. They are delivered to the engineman from block to block through the medium of the signal. The language of the signal is easy to understand and difficult to forget. The signal aspects are few in number and may be regarded as instructions reduced to the minimum in standard form, and hence, there is little opportunity for misunderstanding. The instructions conveyed by the signals are given at the point where they are to be executed and there is no lapse of time in which to forget them."

Please bear these basic facts in mind as we discuss the latest development in train operation by signal indication—"The Dispatcher Controlled Signal System."

This system, from an operating standpoint, is merely an extension and combination of the so-called "remote control switch" and "remote controlled signal" such as have been installed in rapidly increasing numbers in recent years.

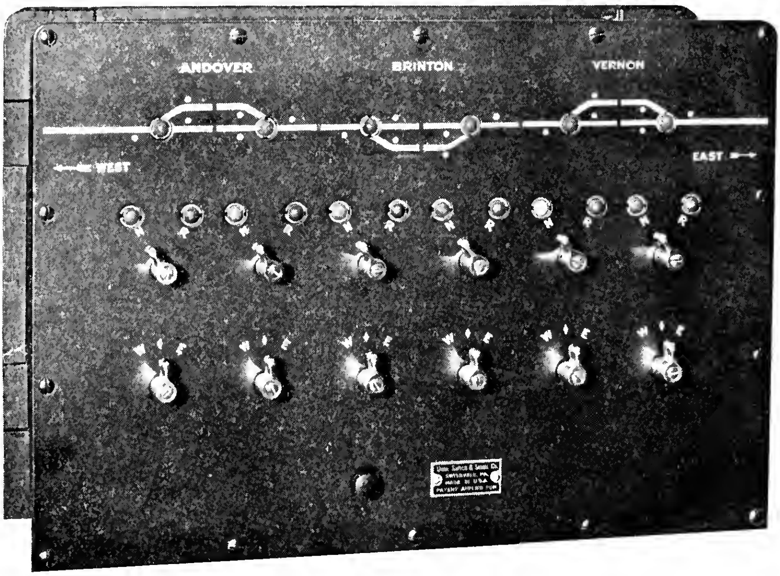
In the Dispatcher Controlled Signal System the head block signals at the ends of passing sidings or the end of double track, instead of being under the control of a local operator, are directly controlled by the Dispatcher from his usual location. In the complete system the switches at these various

locations are also controlled by the dispatcher. In order to intelligently exercise this control the dispatcher receives indications as to the position of the switches and as to whether the track, at these various locations, is occupied or not.

Such a system may be superimposed on any existing signal system, whether such system be manual block, controlled manual block, automatic signalling, the absolute permissive or overlap block system. It may be used on single or multiple track and to govern traffic, or reversals of traffic, in both directions.

The component parts of such a system are the control board with its automatic train graph, the signals, the power operated switch machines and the track circuits.

The CONTROL BOARD—an example of which we have here—is located in the dispatcher's office and is the means by



The Central Board in the Dispatcher's Office

which the dispatcher controls the switches and signals in his territory. Across the top of the board is a miniature track layout of the territory controlled, and equipped with small lights at each power operated switch, which when lighted indicate that that particular section of the track is occupied by a train.

The switch control levers are arranged in a horizontal row, each directly below the switch on the track layout which it controls. Two lights are provided with each switch lever,

which indicate the actual locked up position of the switch, one light, of course, being lighted when the switch is in the normal position and the other when the switch is in the reverse position.

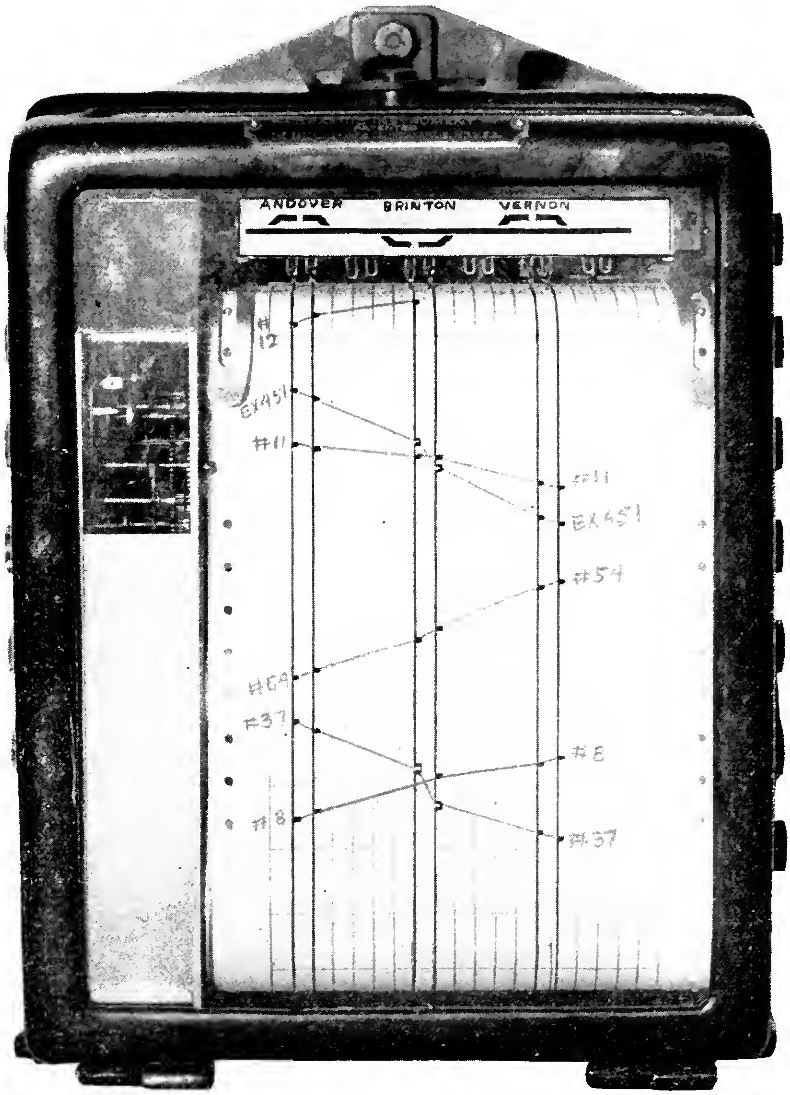
The signal control levers are also located in a horizontal row and again directly below the location of the signals they control. Only one signal lever is required to control a group of signals at the end of a passing track. Normally this lever is in the central position with all signals at stop. Movement to the right clears the signals for traffic in the corresponding direction, movement to the left clearing signals in the same group for traffic in the opposite direction. In either case, whether the signal to be displayed will be for the main track or for the siding movement depends entirely on the position of the switch, thus preventing the displaying of a signal other than that corresponding to the switch position.

An AUTOMATIC TRAIN GRAPH is a vital abjunct to the control board. It is located near the dispatcher's table, so that notations regarding train movements can be made directly on the graph sheet. The automatic train graph records the passing of each train over the track circuit located at each end of every passing siding. Thus the dispatcher has before him an automatically made record of every train move made in the territory controlled. This tells him whether a train is losing time, running on time or making up time, because the train automatically "OS"es itself on the graph sheet as it proceeds over the division. This information thus gives the dispatcher the equivalent of three trick operation at all points in the territory controlled, so that he is not confronted with the situation oftentimes occuring under present methods of operation where trains are "lost" for a considerable period of time while running past one or two—and at night often more—unattended block stations.

The other parts of the system—the SIGNALS, POWER SWITCH MECHANISMS and TRACK CIRCUITS—are of the standard types which have given reliable operation for many years in power signalling and interlocking.

If there is likely to be a considerable amount of switching necessary at a location equipped with a power operated switch a dual control switch mechanism is advisable in order to relieve the dispatcher of the necessity of operating the switch and

signals for each switching move. This dual control mechanism provides not only for power operation of the switch in the usual way, but the switch may also be operated by hand on instructions from the dispatcher. In this case, the train crew



The Automatic Train Graph with Train Records

desiring to operate the switch by hand unlocks a selector lever (a lever similar to the hand throw lever of the ordinary switch stand) which, after being thrown, cuts the power off of the

switch mechanism and leaves the switch free to be thrown by the usual hand throw lever. The throwing of the selector lever to the hand throw position not only cuts the power off of the switch mechanism but also sets the signals at stop. Thus any switching operations carried out are done so under signal protection. After hand operation is completed the selector lever is returned to its normal position, thus returning both signals and switch mechanism to the control of the dispatcher.

The Dispatcher Controlled Signal System employs the usual detector or switch locking which insures that a switch cannot be moved by the dispatcher if a train is on the "fouling" circuit. In addition, approach locking circuits are provided to prevent the dispatcher taking the signal away and reversing the switch ahead of an approaching train. However, the dispatcher can place the signals at stop at any time. Thus if, for some emergency reason, it is necessary that the dispatcher change the route ahead of a train, he places the signals at stop. To change the position of the switch it is then necessary that the train stop and the crew obtain instructions from the dispatcher to push a release, located near the switch, which will release the approach locking and permit of the switch being operated by the dispatcher. Thus, it will be seen that the same protection as is now obtained in modern interlocking is also obtained in the Dispatcher Controlled Signal System.

In connection with this system, it is desirable that at least one telephone be located at each end of a passing siding and also at switches where a train may clear the main line. These telephones are of considerable value in giving instructions to work trains, for switching movements and in case of emergency. Most sidings are now equipped with at least one telephone and in general it may be said that additional telephones will be of advantage in reducing delay time and making the system of even greater flexibility for facilitating train movements.

We will now briefly demonstrate the operation of the control board, after which we will show by moving pictures the actual operation of the system.

To operate a switch from normal to reverse, to clear a signal or put a signal to stop, requires no more effort on the part of the dispatcher than is now required of him to call an operator under the telegraph or telephone system.

If he has an opposing meet to make he operates the switch at one end of the passing siding, clears the signal for movement into the siding and then awaits the arrival of the meet-

ing trains. After the train to take siding is into clear he puts the signal lever to the stop position (the signal itself has, of course, gone to stop as soon as the head end of the train passed it), moves the switch lever to the normal position and then moves the signal lever to the proper position to permit the main line movement to proceed. Not only will these actions take place in their proper sequence but that they have done so will be conveyed to the dispatcher by the indication lights. After the main line movement has passed the first end of the passing track, the dispatcher puts the signals at that location to stop by moving the lever controlling those signals to the center position, then moves the switch lever to the reverse position, after which he puts the signal lever in proper position for movement off the passing track. When the train has moved off the passing track and has gone beyond the track circuit governing over the switch, the dispatcher places the signal lever in the center position, restores the switch lever to the normal position and conditions are then again as before the meet, and ready for the next train movement.

The operation for run around movements is quite similar, except of course a signal cannot be cleared for the following movement until the train in advance permits the signal to assume an approach or proceed position in accord with present automatic signal practice.

The Dispatcher Controlled Signal System has the following advantages:

INCREASES earnings, track capacity, use of equipment, daily car mileage, safety of operation;

DECREASES chance of errors due to use of train orders, chance of collisions and derailments, overtime, fuel consumption, wear and tear of equipment, operating expenses;

PROVIDES the dispatcher with instant information relative to trains holding to schedule or losing time, automatic "OS"ing without delay or chance of error, for the more intensive use of existing track facilities;

FACILITATES meets on close schedule, handling of extra traffic, stopping trains in case of emergency.

These advantages will be even more apparent after you have seen the moving pictures of this system.

VICE-PRESIDENT McABEE: Gentlemen, you have

heard a wonderful address. I am sure Mr. Rudd will be willing to answer any questions any of you may wish to ask him.

MR. F. M. BROWN: I would like to ask whether or not the apparatus contemplates a combination of automatic block signals with the system.

MR. RUDD: Not necessarily. You can have just the head block signals if you want them. Of course if you want to get the ultimate of your track capacity you want the automatic signals too. It depends on the distance between sidings.

MR. BROWN: Would the system combine with the automatic train control, I mean the automatic train stop system?

MR. RUDD: I do not quite get the reason for that.

MR. BROWN: I have in mind the dispatcher's control system plus the automatic block signals plus the automatic train stop. Can they all be worked in conjunction?

MR. RUDD: There is no reason why you cannot get it if you want it.

MR. BROWN: What is the limit of your graph with respect to the number of trains operating?

MR. RUDD: The number of trains operating does not limit the graph. You have one pen on the graph for each end of each passing siding. You do not have a separate pen for each train.

MR. BROWN: Then do I understand the graph does not supplant a train dispatcher's train sheet record?

MR. RUDD: It would if you wanted it to. The dispatcher will have to make notations on that graph to be a complete record, as to train number, etc. I might explain that the graph as it is ordinarily mounted is horizontal. It is set up here vertically so you can see it more easily. As the pen makes a jog the dispatcher knows what that train is. He is bound to know it. He writes the number of the train against the jog.

MR. BROWN: I understood you to say that the graph did not carry with it the complete record of the train from one end of the division to the other.

MR. RUDD: Oh, yes it does, but you have to pick it out

by marking it down as the train passes over these various locations. In exactly the same way you make notations now on your train sheet as you receive your reports from your operator that train No. so and so has passed such and such block station.

MR. BROWN: How would you indicate the complete record of the train from the initial to the terminal station as shown on the ordinary train dispatcher's train sheet by means of the graph?

MR. RUDD: I never said I would. I say you can if you want to.

MR. BROWN: Does it not require a supplementary record on the ordinary train dispatcher's sheet in addition to the graph? In other words with the ordinary train dispatcher's record, the procedure is to start a train from an initial station and record it to the terminal. Does the graph provide the same complete record from terminal to terminal?

MR. RUDD: With your present method you have a train sheet in your dispatcher's office and you have also the local operator's block sheet and in case of investigation you can compare the two. But if you maintain your dispatcher's train sheet and the automatic graph you have the same you have got now and the automatic graph is bound to be accurate as far as time is concerned.

MR. BROWN: What is the time spread with regard to the perpendicular lines on the graph?

MR. RUDD: There is no time spread horizontally. Your paper travels at a predetermined rate, whatever you want. You can have it travel 3″ an hour or 1″ an hour or whatever you want.

MR. BROWN: Where dispatcher unlocks the train control switches to permit a train crew to do promiscuous switching and the crew fails to return switch to normal. Do the signals stop all movements at that switch until some one replaces it to normal?

MR. RUDD: Yes sir. The next train that comes along finds the signal at stop and he calls up the dispatcher and wants to know what they are holding him up for and he

tells them to go and restore that selectore lever to normal. It means a stopping of that train only.

MR. BROWN: One more question. Does this system contemplate the use of power lines auxiliary to the system?

MR. RUDD: I am not quite sure how to answer that as I am not quite sure what you mean by power lines. Power lines for the operation of the switch at each location.

MR. BROWN: How do you provide current for the remote control switches. Is that done by means of power lines or storage battery system?

MR. RUDD: If you are operating the signals by storage battery you can continue to do so. You can operate your switch mechanism by storage battery or primary battery. Your control is carried on a pair of line wires.

MR. BROWN: But as I understood it this train dispatcher system can be used in conjunction with the automatic block signal and the automatic train stop Union Switch and Signal system, three in one.

MR. RUDD: Yes sir.

MR. C. O. DAMBACH: What is the expense of keeping these switches open, clear of snow and ice, etc.?

MR. RUDD: No more than you have at the present time.

MR. DAMBACH: At the present time you have them in thickly populated territory.

MR. RUDD: The switch point is the same whether it is power operated or hand operated, it has to be kept clear.

MR. DAMBACH: What advantage would there be, if any, in that system on double track?

MR. RUDD: Just as much as on single track. It can be used on either single or multiple track, it can be used to cover traffic or reversals of traffic in both directions.

MR. DAMBACH: You spoke of using it in connection with manually operated signals. How would you handle that?

MR. RUDD: I said it could be superimposed on manually operated signals. In that case your signals that are now

manually operated would be power operated when you went over to this system.

MR. DAMBACH: I noticed you said nothing about what this system was going to cost. Was that intentional?

MR. RUDD: I will say that I purposely omitted it because any figure that I could give you would not mean a thing, because the cost is dependent entirely on the territory, the number of sidings, the distance between sidings, whether you want the complete system—everything power operated. All those factors enter into the cost. You could not give any typical figure.

MR. DAMBACH: If I give you an illustration, can you give me a figure?

MR. RUDD: Not without working it out.

MR. DAMBACH: Speaking of Mr. Brown's statement with regard to doing away with the train dispatcher's sheet. how would you take care of the other information now contained in the dispatcher's sheet, such as the make up of crew tonnage and other statistics?

MR. RUDD: I am not recommending doing away with the train dispatcher's sheet. I am stating that in the automatic graph you have a better check against the train dispatcher's sheet than you now have with your block operator's sheet.

MR. W. M. POST: I examined a similar installation on the New York Central, and I would like to try to make clear the point that has been raised as to the use of the graph and whether it can be substituted for the train dispatcher's sheet. I visited the installation on the New York Central road somewhat similar to this, where they had a graph. They used the graph for keeping records of the train moving from one reporting point to another. The train dispatcher had another sheet on which he marked all other information that was required, such as the engineman's name, the conductor's name, and any other records he might want to keep and that was pasted on the graph record at the end of the day's work.

Sometime ago I visited an installation on the Missouri Pacific. It was not a train dispatcher system but somewhat similar. Trains were moved by signal indication under a controlled manual block system. Passing siding switches were

remotely operated, and it was interesting to note the operation at lap sidings. Two freight trains taking the sidings would be passed without stopping. That would work out with this system, no doubt, where they had lap sidings.

MR. RUDD: I think so.

MR. BROWN: Just one more question about this graph, that I do not get clearly. Most of the dispatcher's time is taken up in transmitting orders and recording trains, and his train sheet must contain a lot of information that your graph could not possibly record. I have in mind the name of engineer and conductor, time on duty, the cars and all the details connected with the train, on not only one but three tricks in 24 hours. Suppose the graph is dispensed with and you have dispensed with all the reporting stations and put the train in charge of one centralized point with respect to signals and switches is it possible for the dispatcher to get all the information at each block or passing siding on the standard train sheet that he is now able to get from block and reporting stations?

MR. RUDD: Yes, provided he never misses one of these lights going on and off.

MR. BROWN: He has to be alert all the time?

MR. RUDD: Exactly. I think Mr. Brown will agree with me that under present systems of operation it is quite frequent for the dispatcher to have to call an operator and ask him for an O.S. on a train.

A MEMBER: May I ask a question. I would like to inquire when a road changes over from its present system of block operators and dispatchers, if you put some operators out of a job you have to hire more dispatchers to take their places?

MR. RUDD: I would say that under ordinary circumstances you have released the dispatcher from so much of this communication with the operators that the dispatcher's work is really lightened. Instead of increasing his work he has an easier time than he had before and he has it all under his own thumb. He does not have to worry about the other fellow.

MR. BROWN: I do not want to monopolize the floor but suppose you use the standard train dispatcher's record plus the graph, is it then possible for the dispatcher in case

he misses the light to go back and record the train on train sheet in the usual way by using the graph record?

MR. RUDD: Yes, he cannot only do that but he can record when the train hits the circuit and when it is clear.

MR. DAMBACH: You have said a lot about saving time. At present, if the train does not make the time over the road you ask the engineer what is wrong and the next station he tells you about it. You haven't anything to take the place of that in this system.

MR. RUDD: Except this, that as you watch the graph you will know approximately the time that train ought to take between certain points and you find he is not making it. If he is not making the time between these two points, instead of giving him a clear signal at this point you stop him. When he stops he has to call up to find out why he is stopped.

MR. DAMBACH: Under the present system he would not stop.

MR. RUDD: That comes back into a question as to which way you are going to save more stops. Are you going to save more stops by what ought to be a rare occurrence, engine failure, or by eliminating every train stop at each end of every siding that a train takes?

MR. DAMBACH: I appreciate the fact that you have less stops, but you have to recognize the other factors.

MR. C. D. O'CONNOR: On a multiple track system working switching engines over a large interlocking plant, can you release that plant, the same way you release the remote siding?

MR. RUDD: No, you would keep the interlocking plant just as you have it now. If you have a large interlocking plant within the territory controlled that would still be handled by operators just as now.

MR. BROWN: How would you proceed in case you have two trains light or short trains closing up and taking a siding for a train in the opposite direction? If one train sets the signals how could you move up the second train into the siding?

MR. RUDD: The train sets the signals behind it exactly the same as is now done by trains in automatic signal territory.

MR. BROWN: Then there is no means of closing up two closely following sections on one siding?

MR. RUDD: Absolutely. All you have to do is to run by signal indication. For example, set up the siding for the man to go in at Brinton. The train comes along and it is a short train. He will naturally go down to the signal at the end of the siding. When he first occupies this track circuit he sets the signals at stop. As soon as he goes off that track circuit that signal goes to the proceed position for "take siding" the same as it was before he hit that track circuit—unless the operator has set the signal back to stop.

VICE-PRESIDENT McABEE: I think we have had a very elaborate discussion of this question, and possibly Mr. Rudd's explanation has discredited the introduction I gave him. He is not dead by any means.

MR. RUDD: I thank you, sir.

MR. E. EMERY: Mr. President, Mr. Rudd has certainly given us a very fine idea of the operation of the system, and I would move a rising vote of thanks to Mr. Rudd in appreciation of his paper.

The motion was duly seconded and prevailed by unanimous rising vote.

There being no further business, upon motion, meeting adjourned.

J. D. CONWAY, Secretary.

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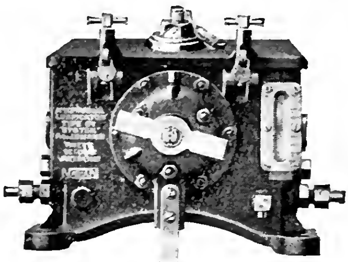

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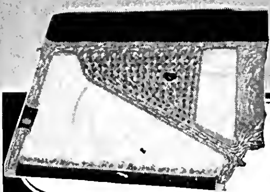
ROLLER BEARINGS FOR RAILWAY EQUIPMENT

By WALTER C. SANDERS, General Manager, Railway Division, The Timken Roller Bearing Co., Canton, Ohio.



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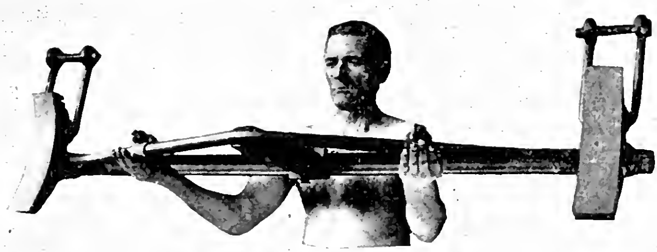

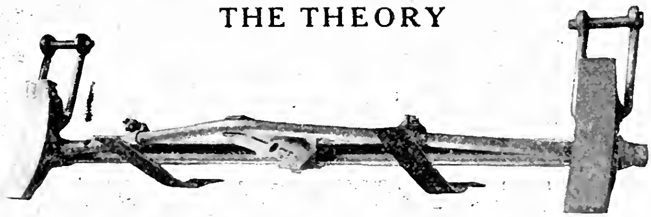

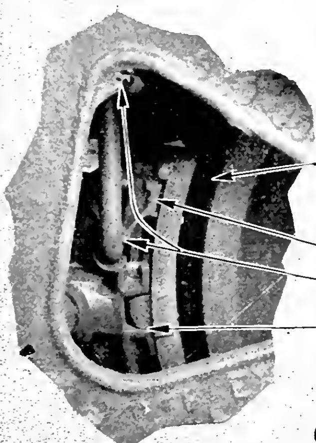

OFFICIAL PROCEEDINGS

OF

The Railway Club of Pittsburgh

Organized October 18, 1901

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Meetings held fourth Thursday of each month except June, July and August

PROCEEDINGS OF MEETING

FEBRUARY 23, 1928

The meeting was called to order at the Fort Pitt Hotel, Pittsburgh, Pa., at 8:00 o'clock P. M., with President E. J. Devans in the chair.

The following gentlemen registered:

MEMBERS

Adams, W. A.
Allison, John
Altsman, W. H.
Ambrose, W. F.
Babcock, F. H.
Bachner, M. G.
Bailey, Frank G.
Bald, E. J.
Balzer, C. E.
Beam, E. J.
Bishop, C. L.
Blair, John R.
Borchers, E. A.
Bowen, J. T.
Brinkhoff, W. H.
Brogan, J. E.
Brose, J. A.
Brown, F. M.
Burns, E. A.
Campbell, C. A.
Campbell, J. T.
Cannon, T. E.
Carlson, Frank R.
Carlson, H. E.
Cipro, Thomas
Clark, Charles H.
Clifford, Charles M.
Conway, J. D.
Cotter, G. L.
Craig, W. J.
Cunningham, W. P.
Dalzell, W. E.
Davis, Charles S.
Devans, E. J.
Diven, J. B.
Donovan, J. J.
Durkin, James E.
Eagan, J. T.
Eichhorn, T. F.
Elverson, Howard W.
Emery, E.
Faix, Joseph
Farrell, G. R.
Fendner, W. J.
Fieldson, P. H.
Fike, James W.
Fisher, Harry G.
Fletcher, Albert
Flynn, C. E.
Follett, W. F.
Frauenheim, A. M.
Freshwater, F. H.
Fritz, A. A.
Fults, J. H.
Furch, George J.
Gardner, K. C.
Gilg, Henry F.
Glenn, J. H.
Goda, P. H.
Gordon, George
Haller, Jacob
Haller, Nelson M.
Hansen, William C.
Haskell, B.
Hastings, Walter S.
Heinlein, George J.
Herlehy, David T.
Hershey, O. W.
Hill, R. W.
Hickling, F. G.
Holleran, T. J.
Holmes, E. H.
Horner, William
Irwin, R. D.
Karns, C. A.
Kaup, H. E.
Keefe, E. A.
Kelly, L. J.

Kelly, J. P.
Kelly, J. W.
King, I. C.
Glassen, F. G.
Kranse, H. A.
Kroske, J. F.
Kummer, Joseph H.
Laird, E. C.
Laird, G. R.
Lanahan, J. S.
Landis, William C.
Leckey, Ralph F.
Lobez, P. L.
Lower, N. M.
Lowry, William F., Jr.
Ludgate, B. A.
Lynn, William
McGeorge, D. W.
McGaw, William L.
McHugh, C. A.
McLaughlin, H. B.
McManus, C. J.
Manson, A. J.
Marlow, G. A.
Matheny, George W.
Merscher, John
Miller, J.
Mitchell, W. S.
Moore, Donald
Morris, J. H.
Moses, G. L.
Moyer, Oscar G. A.
Muir, R. Y.
Myers, T. P.
Nelson, R. F.
Nelson, W. M.
Ness, H. S.
Norris, J. L.
O'Connor, M. J.
Oppermann, E. W.
Painter, Joseph
Palmer, E. A.
Parke, F. H.
Passino, F. J.
Peiffer, Charles E.
Pickard, S. B.
Post, F. H.
Provost, S. W.
Ralston, J. A.
Rauschart, E. A.
Record, J. F.
Reddick, Warren E.
Redding, P. E.
Renshaw, W. B.
Roan, H. E.
Rodda, G. A.
Rogers, Robert
Roth, P. J.
Rowland, F. S.
Rowles, L. L.
Rushneck, G. L.
Salisbury, William
Saltic, Thomas
Sayre, F. N.
Schaacke, William
Searles, E. J.
Shannon, David E.
Sharp, H. W.
Sharp, James
Shea, D. S.
Sheedy, J. A.
Shelly, D. L.
Sheridan, T. F.
Showalter, Joseph
Simons, Philip
Stamets, William K
Stebler, W. J.
Stevens, L. V.
Stevens, R. R.
Stoehr, Arthur L.
Stoffregen, Louis E.
Stokes, A. H.
Stump, O. C.
Sutherland, Lloyd
Sykes, A. H.
Thompson, F. J.
Thompson, L. D.
Trance, F.
Van Blarcom, W. C.
Van Wormer, G. M.
Warner, R. H.
Warren, A. T.
Whitaker, U. A.
White, Robert H.
Wikander, O. R.
Williams, R. R.
Winslow, S. H.
Wright, John B.
Wright, O. L.
Wynne, F. E.
Zilian, R. F.

VISITORS

Ahrens, A. B.
Aldridge, Jesse
Atwelt, C. A.
Bales, William
Balliet, H. S.
Beck, W. R.
Beison, H. O.
Boore, J. P.
Brandt, B. H.
Hill, F. J.
Brown, E. T.
Burghan, C. E.
Bushman, Charles S.
Cordie, P. R.
Courson, L. F.
Davis, Wm. B.
Dean, W. E.
Farfan, Robert F.
Gallant, A. R.
Gilbert, C. T.
Halferty, I. H.
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Harvey, James H.
Hebor, J. J.
Heimbach, A. E.
Hektner, Joel
Herlihy, J. J.
Hershey, N. D.
Hildebrand, L. B.
Hiner, L. D.
Horton, H. R.
Housten, H. A.
Justis, I. J.
Lauer, T. J.
Lescany, J.
Leschke, A. H.
Lewis, S. B.
Lunde, T.
Maloney, J. J.
Mullen, Thomas
Murray, S.
Myers, R. C.
McConnell, J. A.
McKee, F. J.
McManus, James J.
Orr, H. H.
Palmer, C. D.
Peck, W. F.
Pennington, F. W.
Petrot, L. J.
Poster, Irving
Potter, Oscar L.
Puette, J. P.
Purnell, Charles G.
Rieger, N. H.
Robertson, M. L.
Sage, Chester W.
Salter, J. A.
Schlieper, Charles
Schmitt, Raymond F.
Schrontz, S. B.
Smith, Sion B.
Sollinger, Howard H.
Steigerwalt, R. W.
Taggart, J. G.
Tesch, W. J.
Titus, B. F.
Towle, N. C.
Walton, H. S.
Wetzel, W. R.
White, A. A.
White, W. W.
Willby, N. H.
Yetso, J. J.

The call of the roll was dispensed with, the record attendance being obtained through the registration cards.

The reading of the minutes of the last meeting was dispensed with as they have appeared in printed form and been distributed to the members.

The Secretary read the following list of applications for membership:

Allen, H. A., Marine & Railway Manager, S. K. F. Industries,

Inc., 40 E. 34th Street, New York, N. Y. Recommended by W. H. Altsman.

Baker, H. M., Clerk, Aliquippa & Southern Railroad, Monaca National Bank Building, Monaca, Pa. Recommended by C. D. O'Connor.

Beeson, H. L., Inspector, Monongahela Railway Company, West Brownsville, Pa. Recommended by W. P. Cunningham.

Bennett, Alonzo H., General Foreman, B. R. & P. Ry., 520 S. State Street, Du Bois, Pa. Recommended by E. J. Devans.

Bishop, C. L., Chief Clerk, Pittsburgh, Mahoning & Shenango Valley Freight Committee, 606 Chamber of Commerce Building, Pittsburgh, Pa. Recommended by E. J. Devans.

Blest, Minot C., Chief Engineer, Pressed Steel Car Company, Farmers Bank Building, Pittsburgh, Pa. Recommended by A Stucki.

Carlson, Harry E., Transitman, P. & L. E. R. R., 700 Eighteenth Avenue, Beaver Falls, Pa. Recommended by J. H. Lewis.

Duchene, L. P., Traffic Clerk, Aliquippa & Southern Railroad, 1906 Main Street, Woodlawn, Pa. Recommended by C. D. O'Connor.

Dunmire, J. O., Engine House Foreman, B. & O. R. R., Box 224, Foxburg, Pa. Recommended by J. P. Kane.

Eder, F. J., Clerk, Aliquippa & Southern Railroad, 811 Sixteenth Street, Woodlawn, Pa. Recommended by C. D. O'Connor.

Fallon, M. L., Assistant Road Master, B. R. & P. Ry., Punxsutawney, Pa. Recommended by E. J. Devans.

Haller, C. T., President, Colonial Supply Company, 217 Water Street, Pittsburgh, Pa. Recommended by W. H. Altsman.

Hayes, George, Yard Master, Aliquippa & Southern Railroad, 1809 Irwin Street, Woodlawn, Pa. Recommended by C. D. O'Connor.

Hiner, L. D., Sales Agent, Railway Steel-Spring Company, 617 Farmers Bank Building, Pittsburgh, Pa. Recommended by S. W. Provost.

Holohan, S. V., Passenger Conductor, B. R. & P Ry., 364 Norwood Avenue, Buffalo, N. Y. Recommended by E. J. Devans.

Horwick, George M., Car Distributor, B. R. & P. Ry., 3 Jefferson Street, Punxsutawney, Pa. Recommended by E. J. Devans.

Howe, H. W., Yard Master, Aliquippa & Southern Railroad, 573 Remo Street, Rochester, Pa. Recommended by C. D. O'Connor.

Jones, W. F., Purchasing Agent, Dining Service, New York Central Lines, 466 Lexington Avenue, New York, N. Y. Recommended by E. J. Devans.

Lobough, Smith S., Conductor, B. R. & P. Ry., 209 Oakland Avenue, Punxsutawney, Pa. Recommended by E. J. Devans.

Mace, W. S., Yard Master, Aliquippa & Southern Railroad, 1815 McMinn Street, Woodlawn, Pa. Recommended by C. D. O'Connor.

Meehan, C. L., Assistant Train Master, Aliquippa & Southern Railroad, 1929 Irwin Street, Woodlawn, Pa. Recommended by C. D. O'Connor.

Myers, R. C., Storekeeper, Monongahela Railway Company, Brownsville, Pa. Recommended by W. P. Cunningham.

McNaughton, W. H., Passenger Conductor, B. R. & P. Ry., 196 Crescent Avenue, Buffalo, N. Y. Recommended by E. J. Devans.

Pye, David W., President, Tuco Products Corporation, 30 Church Street, New York, N. Y. Recommended by E. J. Devans.

Shaddock, C. E., Train Dispatcher, Aliquippa & Southern Railroad, 1719 Main Street, Woodlawn, Pa. Recommended by C. D. O'Connor.

Stewart, L. R., Asst. R. F. of E., Pennsylvania Railroad Co., 385 Second Street, Pitcairn, Pa. Recommended by W. L. Hudson.

Torney, M. G., Yard Master, Aliquippa & Southern Railroad, 163 Spring Street, Woodlawn, Pa. Recommended by C. D. O'Connor.

Tovey, G. F., Asst. Train Master, Aliquippa & Southern Railroad, 1617 Boundary Street, Woodlawn, Pa. Recommended by C. D. O'Connor.

Trautman, William W., Asst. Yard Master, P. & W. Va. Ry.,

507 E. Main Street, Carnegie, Pa. Recommended by R. L. Barrett.

Williams, E. V., Yard Master, Aliquippa & Southern Railroad, 1902 McMinn Street, Woodlawn, Pa. Recommended by C. D. O'Connor.

Williams, R. R., Asst. General Freight Agent, B. R. & P. Ry., 427 Wabash Building, Pittsburgh, Pa. Recommended by E. J. Devans.

PRESIDENT: These applications will be referred to the Executive Committee in due course, and upon approval by them, the gentlemen will become members without further action.

SECRETARY: Since our last meeting I have received word of the death of Frank E. LeGoullon who died on December 19, 1927.

PRESIDENT: An appropriate memorial minute will appear in the next issue of the Proceedings.

If there is no further business we will proceed at once to the paper of the evening, on the subject of Roller Bearings for Railway Equipment, which will be illustrated by lantern slides. The author of the paper, Mr. W. C. Sanders, General Manager, Railway Division, The Timken Roller Bearing Company, Canton, Ohio, cannot be with us, but he is ably represented by Mr. Joel Hektner, Assistant Engineer, who will read the paper and take part in the discussion.

MR. HEKTNER: Mr. President and Gentlemen—Before reading the paper Mr. Sanders asked me to transmit to you, I wish to say a word or two of my own. Most of us are interested more in persons than in things. The reason I open with that statement is that when your Railway Club of Pittsburgh invited Mr. Sanders to come and speak to you, it was because you were interested as much in men who stand behind the product as you were interested in the product itself. I know you are interested in an industry that is now going into a new field, which, up to recently, has seemed almost closed. Mr. Sanders has been one of the men who has had to experience the brunt of the work and the griefs as well as the successes which were encountered. Therefore, I wish that I could be a part of the audience listening to Mr. Sanders instead of speaking myself. Mr. Sanders, however, asked me to read a few remarks which he would like to make and show

you something on the screen which will illustrate the subject of the paper.

ROLLER BEARINGS FOR RAILWAY EQUIPMENT

By WALTER C. SANDERS,
General Manager, Railway Division, The Timken Roller Bearing Co., Canton, Ohio.

In engineering a "bearing" is that particular kind of support which, besides carrying the load imposed upon it by the shaft associated with it, allows the shaft freedom to revolve.

The problem of applying anti-friction bearings to the axles of railway rolling stock is not new, as an idea. The difficulties which for many years stood in the way were not overcome until the railroads were confronted with changed conditions and felt the need for means with which to meet the new conditions.

A few years ago a combination of circumstances arose which made it imperative for the railroads to seek new means

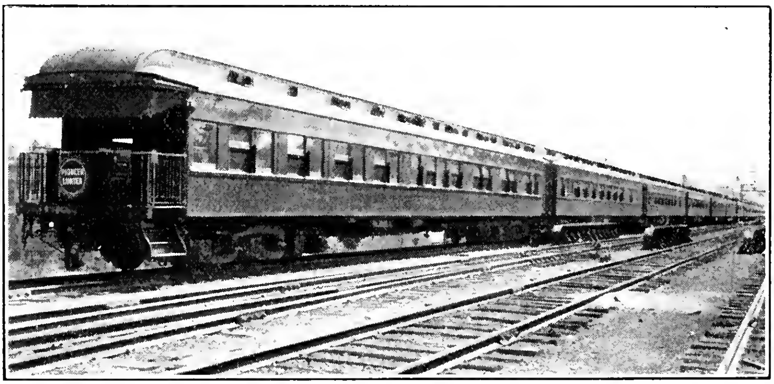

Fig. 1—The "Pioneer Limited" of the Chicago, Milwaukee, St. Paul and Pacific Railway. All cars are on Timken bearings. This train was the first completely equipped roller Pullman train in the history of American Railroads.

for improving their overall operating economy, and for meeting new demands imposed by the public. No method was too radical to merit consideration as long as it had any possibilities. This situation aroused greater interest in the possibilities of anti-friction bearings. Also, in the meantime a good deal of definite information concerning the requirements of the service had been collected, and the development of the bearings themselves had progressed considerably.

A new opportunity then presented itself with the advent of the self-propelled gasoline car. The value of these cars for auxiliary service was well understood, but the limitations of the gasoline engine made it necessary that the operating efficiency of other parts of the car be developed to the fullest extent. Anti-friction bearings played a very important part in this development. The results were so satisfactory that the bearing engineers were encouraged to take the next logical step which was the application of bearings to the axles in heavy railway service.

With this purpose in view, The Timken Roller Bearing Company began tests about six years ago. From the beginning, valuable results were obtained. First-hand knowledge of the service requirements was obtained and reduced to a workable basis. There was also a change in the conception that had always been held concerning the actual relation of train resistance to operating economy. Remarkable possibilities for a reduction in maintenance costs and general improvement in operation were promised. These promises have been more than kept in actual service.

The requirements of the service are too familiar to require discussion, except insofar as they have influenced the design and construction of the bearing proper. Railway Mechanical Engineers have made valuable contributions to the development of a successful bearing and to the methods of applying them.

In order to successfully apply roller bearings to the journals of railroad equipment, certain conditions should be met as follows:

(a) The bearing must have a low frictional resistance for all service conditions.

(b) The bearing must have a long service life.

(c) The design of the bearing should be such that both vertical and thrust loads or any combination of these loads may be carried by the bearing proper.

(d) The application should be such that a quick inspection may be made.

(e) The application should be simple in construction and easy to assemble and disassemble.

(f) The bearing should be adjustable.

(g) Every part of the bearing must be durable in every way.

(h) The design must reflect general railroad practice as far as possible and must show economy in every way.

How these requirements are met in the case of the bearing developed by the company with which the author is associated, can best be shown by a description of the bearing itself.

THE TAPERED ROLLER BEARING PRINCIPLE

The principal object of the tapered construction is to provide capacity in the bearing for the thrust loads, which exist in all railroad applications, with no appreciable sacrifice in

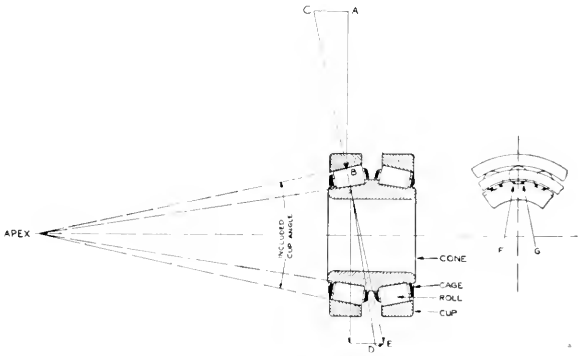

Fig. 2—Diagram showing theory and design of Tapered Roller Bearing.

vertical load carrying power. Fig. 2 shows a Timken Roller Bearing with an included cup angle of a little less than 24 deg. Assuming a load of 100 units AB applied radially or vertically to the roll, the normal pressure CB on the roll is 102 units. The thrust capacity of this particular roll is represented by the line AC and is equal to 20 units. By reason of the fact that only the top rolls in the bearing carry vertical load, while all the rolls are effective under thrust load, the bearing has a thrust capacity almost equal to its vertical capacity. In other words, with an increase of 2 per cent in the normal load on the rolls under vertical loading a thrust capacity nearly equal to the vertical capacity is obtained. By varying the included cup angle the ratio of thrust to vertical or radial capacity can be changed over wide limits.

Another advantage of the tapered construction has proved, however, to be quite as important as the provision for thrust loading. Operation of a roller bearing, particularly at the higher speeds, requires correct alignment of the rollers with respect to the axis of the bearing. If the rollers are not ac-

curately aligned, contact with the races over their entire lengths will not be obtained and dangerous concentration of stresses on small areas will result. In Fig. 2 the reaction of the roller against the rib on the inner races is represented by the line DE. The end of the roller makes contact with the rib on two areas F and G. This double contact holds the rolls in positive alignment entirely independent of the cage and assures an equal distribution of stress over the length of the roll. The aligning principle has been checked by operating bearings without cages at the highest speeds at which the bearings are required to operate in service. The cage acts as a roll spacer when in service and as a retainer when the bearing is stored or handled.

The tapered roller bearing is practically frictionless, the rolling resistance being less than three-tenths of one per cent.

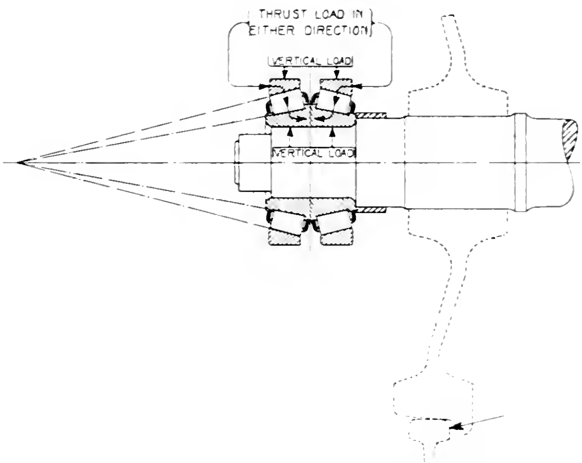

Fig. 3—Diagram showing manner in which Timken tapered roller bearing carries vertical and thrust load and a combination of each in one bearing.

Fig. 3 shows how vertical and thrust loads and combinations of each are carried in a tapered roller bearing. The tapered construction of the bearing makes possible the continuous and positive absorption of both endwise and up-and-down loads or any combination of the two which may occur.

ADJUSTABILITY OF THE TAPERED BEARING

It is an indisputable engineering principle that, whenever two moving parts are in contact, wear must eventually occur. No matter how well the parts of any type of bearing are made, the constant motion, sooner or later must result in wear.

The tapered roller bearing can be satisfactorily adjusted for the small amount of wear which may eventually occur. This adjustment feature also provides wider tolerances for machine work on axles and bearing boxes.

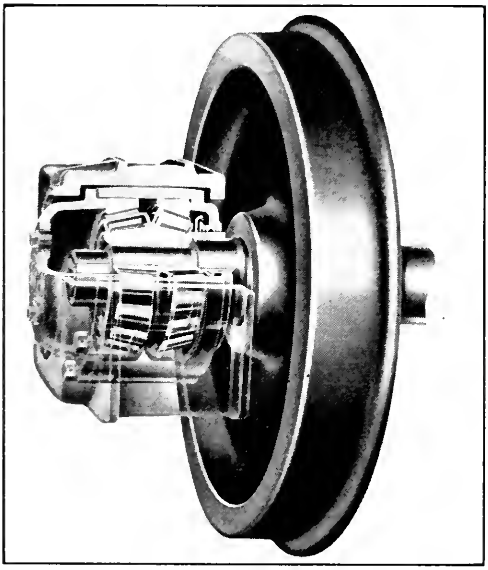

Fig. 4—X-Ray view of Tapered Roller Bearing Application for Passenger Equipment.

The adjustment consists of moving the tapered outer raceway or cup a little farther onto the tapered roller assembly. The whole bearing will then function like new and replacement is eliminated. Adjustment of the bearing is obtained by means of thin shims which are placed between the cover and the inside housing. Adjustment is maintained and the cover and outside cup are held in place by eight cap bolts spaced around the outside of the cover and housing.

Our tests and experiments have shown that in a railroad tapered roller bearing the wear is negligible during the first several years of operation.

DESCRIPTION OF BEARING FOR PASSENGER CAR EQUIPMENT

Since the bearings now used on 62 Pullmans and 77 various types of passenger cars on the Chicago, Milwaukee, St. Paul and Pacific Railway is a typical railway application, its descrip-

tion will serve to cover the essential characteristics. The bearing consists of four main parts, the double cone, or inner raceway, two sets of tapered rolls, two cages, and two cups or outer races. The cone, which is common to both sets of rolls is formed with ribs at both outer ends, and is tapered up to a ribbed apex in the middle. The two sets of tapered rolls are assembled on the cone and are held to proper spacing by their

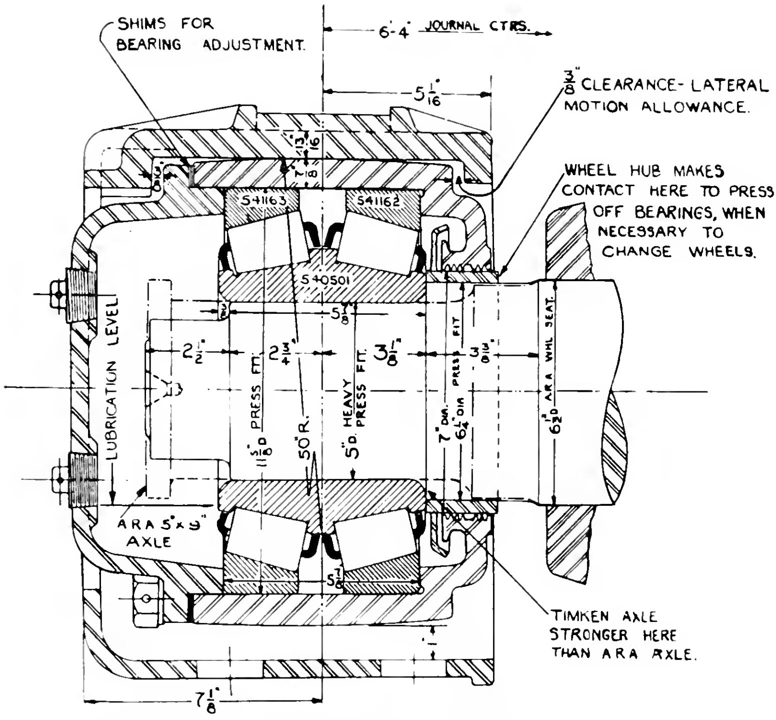

Fig. 5—Application of Timken Roller Bearings for 5 in. by 9 in. size axle. Wheels can be turned without removing bearing from axle. Dot and dash line shows contour of A. R. A. standard axle.

respective cages. The two cups are then assembled over the rolls. The bearing is assembled in the housing and then pressed on the axle, after which the adjustment is made by shims.

The dimensions of the bearing for a 5 in. by 9 in. journal size axle are, bore 5 in.; outside diameter 11⅝ in.; and width of cone at its contact with the axle 6¼ in. The rated capacity of one bearing is 28,900 lb. vertical and 23,275 lb. thrust load, at 750 r.p.m. which with 36 in. wheels corresponds to 80 miles per hour train speed. The capacity of a 5 in. by 9 in. journal size axle is 32,000 lb., while the two bearings used per axle

have an actual vertical capacity of 57,800 lb. at 80 miles per hour and 69,400 lb. at 500 r.p.m. or 53 miles per hour.

In assembly the cone is mounted on the axle under a heavy press fit of from 20 to 30 tons. This will insure the cone remaining tight and prevent wear on the axle by creeping. The cups are given a press fit in the housing of 3 to 5 tons insuring against rotation or creeping in the housing.

The journal box proper consists of two housings, called the inside and outside housings, and the cover. For this reason it is generally called a double box or self-aligning application. The inside housing which contains the bearing is crowned at the top and bottom; the crown having about the same radius as the plain bearing box wedge, which gives the application the feature of self-alignment. When the top is worn the housing may be inverted and a new aligning surface will thus be brought in contact with the outside housing.

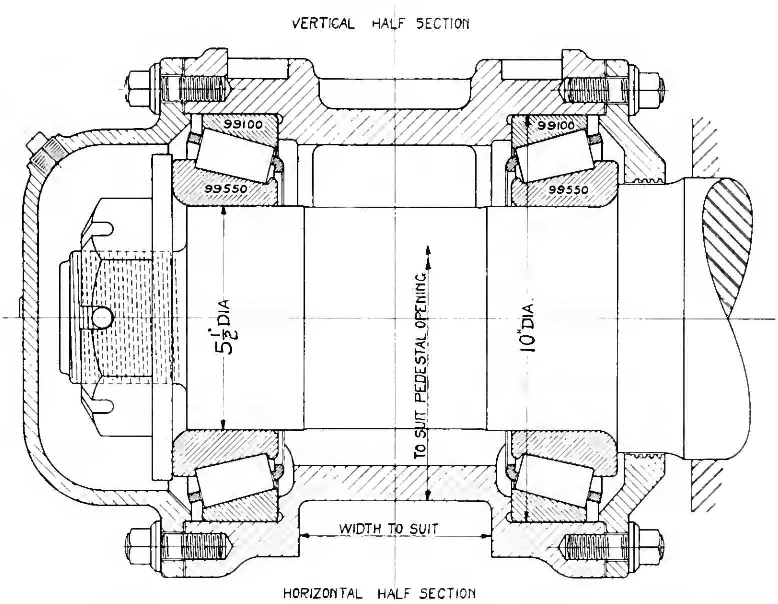

Fig. 6—"Hour-glass type of tapered roller bearing journal application for use in existing plain bearing truck pedestal. This application will interchange with plain bearings.

One of the most important features of the design is the degree of flexibility possible in the application.

The enclosure or lubricant retaining method is shown very plainly in the X-ray view. A pressed steel oil flinger is pressed on and welded to the cone removal sleeve. All oil which is

thrown over the flinger is drained to the bottom of the box by the groove on the inside of the box enclosure.

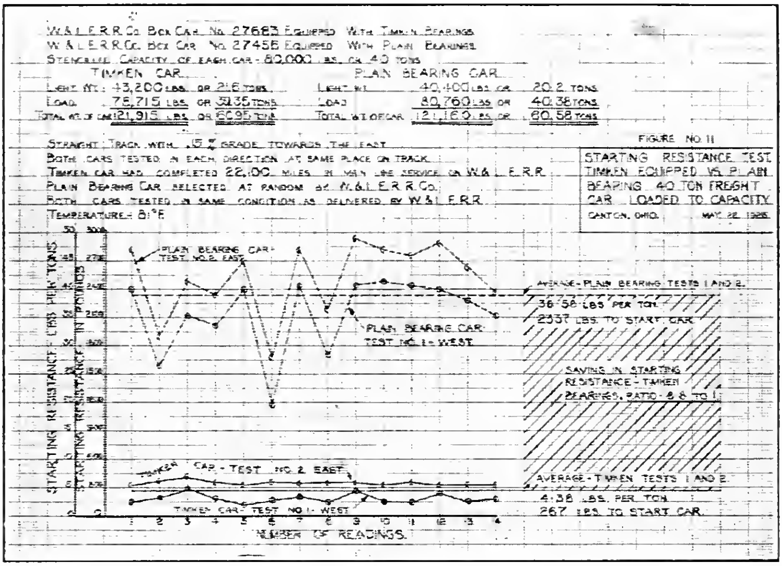

Fig. 7—Starting resistance test. Tapered roller bearing against plain bearing freight car, 40-ton capacity, Canton, Ohio, May 22, 1925.

The cone removal sleeve also serves the additional duty of removing the bearing and box from the axle. As the wheel is pressed off the axle it comes in contact with the sleeve thereby pushing off the bearing and box.

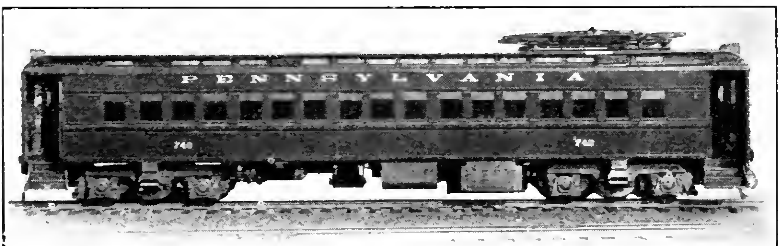

Fig. 8—Multiple Unit car equipped with Timken roller bearings. 5½ in. by 10 in. axles.

The bearing and box can also be removed by means of a split housing with pressure applied from a hydraulic jack which makes contact with the end of the axle. A flange on the split housing makes contact with the cone removal sleeve.

ROLLER BEARINGS FOR FREIGHT EQUIPMENT

While the application of roller bearings to passenger train equipment is receiving the greatest attention at the present time from the railroads, the greatest benefits will be obtained through their application to freight train equipment.

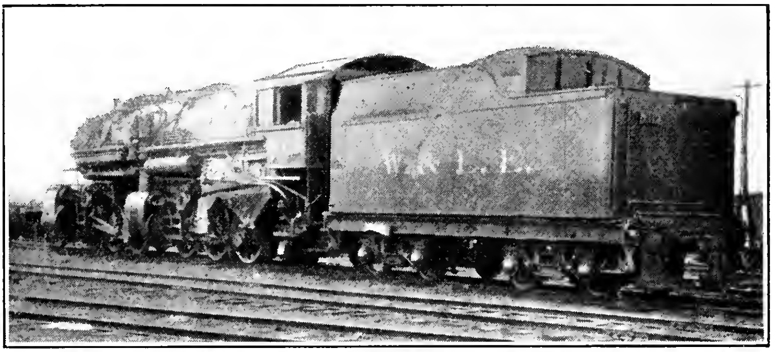

Fig. 9—Mallet locomotive tender equipped with Timken bearings. This application has been in service three and one-half years. 6 in. by 11 in. axles.

The company with which the author is associated has in successful operation a number of 50-ton and 70-ton freight cars embodying an entirely new type of inboard trucks. It is believed that this type of truck can ultimately be built by the car builders and railroads including the roller bearings at a cost not greatly exceeding that of the existing type of freight truck. An inboard truck, is one having the bearings mounted in a housing on the axle inside the wheels, there being no journal

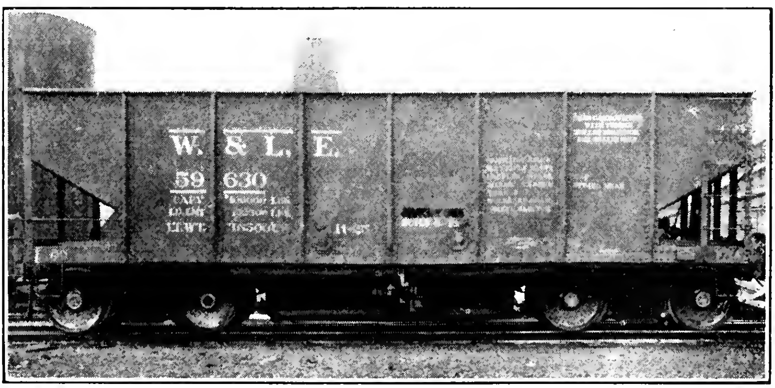

Fig. 10 50-ton hopper car equipped with inboard type Timken roller bearing trucks.

boxes and bearings outside the wheels. The freight cars equipped with this type of inboard trucks weigh appreciably less than the plain bearing freight cars, thus effecting a power saving because of their lighter weight as well as through the use of roller bearings.

Figs. 10 and 11 show the inboard truck as applied to freight cars which are under test in regular revenue service.

Fig. 12 shows the method of testing the inboard truck in the laboratory, one truck is turned upside down on the other and the wheels driven by means of a belt from an electric motor. The full axle load is applied and the trucks are operated continuously at speeds of from 45 to 65 miles per hour until something happens. The test has been frequently interrupted

Fig. 11—Comparison of Timken inboard and A. R. A. outboard freight car trucks. Considerable weight is saved by placing bearings and side frames inside the wheels.

on account of failure of side frames, springs, wheels; but the performance of the bearings indicate them to be the most substantial component parts of the trucks.

The desirable features of the design of the inboard truck are, first, a marked saving in weight due to the reduction in length and diameter of the axle and a reduction in length and cross section of the bolster and spring plank, and second, simplicity of design. These features may be noted from a consideration of Figs. 10 and 11.

It is a fact that to whatever extent the non-productive

weight of the car can be reduced, to that same extent the productive weight may be increased.

As the expenditure of fuel in hauling a ton is the same whether or not the latter is paying freight, it is evident that the smaller the percentage of non-paying freight or dead weight to the total weight moved, the smaller will be the cost of hauling the paying freight.

It is therefore, a means of increasing the efficiency of operation to decrease the non-productive weight of the car. The inboard type of truck will accomplish this as well as affording all of the other advantages inherent to roller bearings.

The inboard type truck is still in the experimental and development stage, although the tests have progressed far

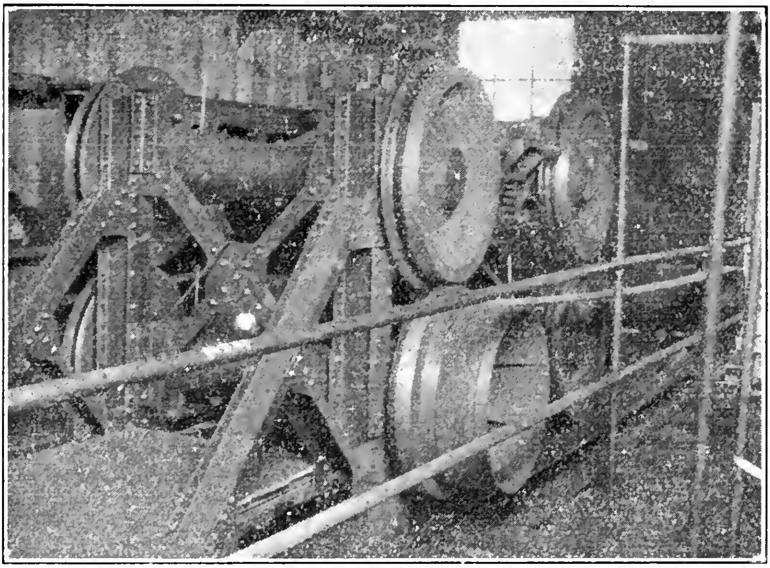

Fig. 12—Method of testing Timken inboard type trucks in laboratory. Full axle load is applied and trucks operated continuously.

enough and the results obtained have indicated that this type of design is very feasible.

The adoption of roller bearings for freight train cars, regardless of the design of truck, faces the difficult problem of interchange. However, so great are the potential savings, that there can be no question about finding a way to solve the interchange problem and put these savings into effect.

It has been suggested that it may be possible to revise the per diem rules in such a manner as to make it profitable for

a railroad to own freight cars that are equipped with roller bearings. It requires no further demonstration to show that it would be profitable to the owner while the cars are on his own rails. It has been suggested that if the per diem rate on roller bearing cars was slightly increased so as to pay the owner a profitable interest on his investment, it would help to solve the problem. Of course the long haul railroads would reap the most benefit from the installation.

The economic advantages to be gained by the universal adoption of roller bearings for use on railroad cars are of many different kinds. The more important may be summarized as follows:

1. The easy running and starting qualities make possible material savings in fuel or energy.
2. The small consumption of lubricants reduces the cost of lubricants. Cost of waste is eliminated.
3. The elimination of the costly and trouble-some hot boxes makes it possible to maintain regular and undisturbed traffic; preventing inconvenience to passengers and delays to freight.
4. Reductions can be made in maintenance inspection expenses as roller bearings do not require the attention now necessary to maintain plain bearings.
5. Roller bearing cars preclude the necessity of cutting down train loads during winter months and make possible the movement of greater tonnage with less power. Roller bearing cars coast much more readily and longer distances than plain bearing cars.
6. The wear and strain on railway rolling stock is materially reduced where roller bearings are used.
7. Roller bearings eliminate the necessity of replacing axles due to worn or cut journals. No wear can take place on the axle.
8. The easy riding qualities of rolling stock are increased as a roller bearing train starts and stops more smoothly than a plain bearing train and has less sway and slap at high speeds.
9. Faster acceleration and greater speed may be obtained.
10. Roller bearing cars will start on grades where power is required to start plain bearing cars.

Roller bearings will bring to the railroads economies so wide in scope and so far reaching in effect as to make it practically impossible to estimate.

PRESIDENT: During the dinner hour Mr. Hektner told me that there was nothing he enjoyed more than engaging in discussion and answering questions. The subject is now before you and I hope we will not have to call on any one to open the discussion or to carry it on.

MR. C. G. PURNELL: I would like to ask Mr. Hektner if the Timken people have developed any facilities for pushing the bearings off the inboard type of axles.

MR. HEKTNER: Our present method has been to apply the pressure at the rim, which is not desirable, but we have been doing it successfully. Our Experimental Department is engaged with that problem.

MR. PURNELL: That can be done on the standard wheel press in the ordinary shop?

MR. HEKTNER: We have an ordinary wheel press doing it.

PRESIDENT: We would be very glad to hear from Mr. Thomas Mullen, of the Louisville & Nashville Railroad.

MR. THOMAS MULLEN: The other men here have something to say on this subject. We have not attached Timken or any other kind of roller bearings on any of our equipment as yet, although we are investigating it for journal equipment.

PRESIDENT: Has any one else any one here he can introduce to carry on the discussion?

MR. OSCAR R. WIKANDER: There is one question in connection with roller bearings that railroad people generally are interested in, and that is fuel economy. In several instances railroads have tried to obtain information on that point by equipping two trains, one with roller bearings and the other with plain bearings, and running them under as nearly identical conditions as possible. It has been found, almost invariably, that if two trains are equipped and run a day or two under the same conditions, the results will indicate that the plain bearings are just as economical as the anti-friction bearings. However, I know of one case, where a railroad ran two passenger trains for a whole year, one with anti-friction bearings and the other with plain bearings under practically identical conditions. The result of this test, which was made in Sweden was that, when computing the fuel consumption over this period, the train with

anti-friction bearings consumed about 11½% less fuel than that equipped with plain bearings.

The reason why not much difference is found when in case of short tests is probably that it takes considerable experience to run an anti-friction bearing train to the best advantage. The engine has a different "feel." The engineer has run plain bearing trains for years and he knows exactly how to get good results with them. When a train is changed to anti-friction bearings it takes time to learn how to obtain the best economy.

I would like to know if Mr. Hektner has any experience on this point in this country?

Whatever the fuel economy may be, that is, however, not the important point in the use of anti-friction bearings for passenger trains. There is a saving in lubrication, a saving in maintenance, etc., but the one outstanding advantage is that you can haul a bigger train. As Mr. Hektner stated, it is possible to haul 19 instead of 14 cars, and that is the great advantage of anti-friction bearings, the same locomotive can handle a bigger traffic.

MR. HEKTNER: Our experience coincides with the last speaker's remarks. We have made our own tests, and have observed tests made on a few railroads where we have made special arrangements, and we have found some results which made us wonder for a while, because in some cases we have found hardly any fuel economy and in others we have found as high as 12 to 15% economy, as far as power consumption goes. I do not know of any other explanation for it than that the last speaker gave. However, my impression is that in comparing two trains or cars apparently identical except for the bearings, it seems impossible to establish exactly equal conditions in every way. Track resistance is a very variable quantity. It is like trying to measure the water level when the water is rough. It is not constant or stable enough to get any accurate measurements during a short time. Over a long period of time you can get an average that will show better results. We have proved that by our own tests, as well as tests that were conducted by disinterested parties.

The last speaker mentioned the effect of anti-friction bearings on train length. I have spoken with train men on the Chicago, Milwaukee, St. Paul and Pacific Railroad and every one of them was very proud of their equipment. I also know of another train man who operated a train of two cars equipped with tapered roller bearings and he said he did not like that

train at all because at stations he always had to keep the brakes on to keep the train from starting off. He had operated a steam train for many years previously and had not become accustomed to the new bearings.

There is one thing I forgot to mention in connection with the freight car trucks I showed you on the screen. The weight of the roller bearing truck is considerably less than that of the standard A.R.A. truck, due to the shorter members, particularly the bolster and axles which are shorter in length and smaller in cross section due to the shorter span. The question of saving weight has considerable effect on railway operating economy, because the empty car itself is dead weight. It is only the load in the car that brings revenue and a dead weight of 2,000 to 3,000 lbs. per car on a long freight train consumes a very large proportion of the actual tractive effort available.

In this connection, I might mention that the problem which confronted the Milwaukee Road before putting in Timken bearings was that they had a program calling for a large amount of new passenger equipment, which was to be much heavier than their old equipment, and they did not have power to haul it unless they adopted one of three alternatives. First, new locomotives. New locomotives meant an enormous expense, not only because of the cost of the locomotives themselves but the capacity of the terminals and bridges and other structures along the line that were affected by the larger locomotives. Second, adding boosters to the old locomotives as an aid in starting the heavier trains. And third, was to apply roller bearings to the cars. By very elaborate and extensive calculations and investigation it was clearly shown that the roller bearings would be by far the cheaper method. It would permit the old power to be used. This theory was more than proven by developments during the past year.

MR. C. E. PEIFFER: Mr. Hektner spoke in his remarks about the bearings needing adjustment. About what length of time would they run before needing adjustment? And also, the service life?

MR. HEKTNER: Our experience has been that we have not found it necessary to make any adjustment except the original one. We have found some small wear in other parts of the bearing than the actual load carrying members; for instance, the cage. The tendency has been to neglect the cage and pay more attention to the load carrying surface. Our

latest problem has been to strengthen the cage and give it the same length of life as the principal parts of the bearing. I do not know of any case where we ever adjusted the bearing after the first adjustment, except that we have had a few boxes that ran too warm when they first went into service and by loosening up the adjustment slightly the temperature dropped.

MR. T. E. CANNON: I am not in any way familiar with these bearings and I haven't anything to say on them, but I would like to ask a question. At what speed does your roller bearing feature run out?

MR. HEKTNER: Do you mean what is the limiting speed? We have not had any failures due to overspeeding.

MR. CANNON: I mean at what speed does your roller bearing feature run out and run into friction bearing.

MR. HEKTNER: The comparison with friction bearings? Tests seem to indicate that the resistance is about equal above 40 miles an hour. The big advantage comes in starting and at speeds below 40 miles an hour.

MR. CANNON: How do you figure the difference between a train of 14 and 19 cars?

MR. HEKTNER: Apparently it is in the starting. We know that the same locomotives haul 19 cars, whereas before they could not haul over 14. The reasons are secondary, but we have certainly been trying to find out what the real reason for it is. We have tested single cars where we have not found any difference in power consumption, particularly in electric service. The tests have been made merely by reading the ammeter in the driving compartment and it seems that the characteristic of the motors is such that the power consumption is not materially affected. The acceleration is more rapid of course, due to the beneficial effect at low speed. In electric service the starting problems are not as severe as in steam service. The power used per ton of car weight is much greater there than it is in steam service, and the elimination of journal friction would of course be a smaller percentage.

PRESIDENT: Mr. McGeorge, of the Edgewater Steel Co., can you add to the discussion?

MR. D. W. McGEORGE: I have been over at the Timken plant a number of times and there are a good many funny

stories come up about the roller bearings in railway service. I would like to ask Mr. Hektner if it is true that one of their biggest problems is to keep the car spotted on the track. That is they claim that they have a lot of trouble with a freight car spotted on a siding at a warehouse to keep the wind from blowing it off the spot.

MR. HEKTNER: I know the car men are always kicking because they have to block the roller bearing cars because they will not stand unless on level track. We have had cases where a high wind started a car.

PRESIDENT: Mr. Leschke, of the Pittsburgh Railways Co., is here tonight and we would like to hear from him.

MR. A. H. LESCHKE: We just equipped four or five cars with the Timken bearings. We have had one car now for two years equipped with another type of roller bearings that showed no power saving. We have been bothered a good deal with thick and thin flanges. Wheels generally have to be serviced approximately every 30,000 miles. This car has been out two years and it was just in the shop recently for new wheels, this car having made approximately 80,000 miles. If that is true of all the roller bearings on the street railways, that they will eliminate thick and thin flanges, it would pay from that angle alone, even though it would not pay from the angle of saving power. If wheels develop thick and thin flanges they will split switches, and they have to bring them in and weld a strip to the thin or cut down the thick flange.

(Mr. Devans in order to catch a train, called Secretary Conway to the chair.)

A MEMBER: I notice in the discussion most of the talk has been given to passenger equipment. Of course we all understand why the first development would be in passenger equipment. The interchange of freight cars going on in some parts of the country, and that is particularly true of the Pittsburgh district. But there are many industrial railroads where their equipments stays largely on their own lines.

I noticed one slide of a hopper car equipped with roller bearings and I would like to ask whether there has been enough experience as yet to show the benefits to be derived from equipping freight cars, especially heavy freight equipment. Do you have a saving in starting and switching?

MR. HEKTNER: Unfortunately we have not had opportunity to test long freight trains, but only one car at a time. We have hopper and box cars in service on a few roads. Our object for the present has been to determine the life of the bearing itself and make sure that the truck is ready for the market, and also to reduce the total cost of construction on the whole truck. We have not as yet offered our freight car trucks to the railroads. The opportunities seem to be very great especially for fast through freights, where the cars remain on the home line and are given a very high mileage per day. For cars that make only the average of 30 miles per day it would be in proportion a larger expense to equip them with roller bearings than if they made twice that mileage per day. Passenger cars of course make the highest mileage and there are at least eight trains that make as much as 4,400 miles a week, and on those cars we arranged that lubrication inspection be made once a month. The plug is taken out of the box and the oil level is examined. Sometimes a little oil is added and in other cases none is added until the next month. We are certain however, that we are going to make strides in freight service.

MR. WIKANDER: Some years ago a train, running from a Swedish iron ore mine down to the harbor in shuttle service, was equipped with anti-friction bearings. Loaded trains went to the harbor and empty trains came back. It was found that with anti-friction bearings the locomotive could haul 39 loaded cars, while with plain bearings all it could haul was 29 such cars. This is an increase of over 34 per cent in freight hauled with the same locomotive over the same track and gives an indication of what can be expected in freight service. It would seem that the main reason why freight service is not so promising for anti-friction bearings in this country is the pooling of the cars. They go all over the country, and no particular railroad gets the benefit of the economy obtained from its roller bearing equipment. The use of roller bearings on freight equipment is however justified where its utilization is intense and the cars remain on the property of the railroad.

MR. J. MILLER: I would like to bring up a subject that may not seem very large to you but it is of importance to some of us. I would like to know just what provision is made for our car inspectors to detect any defects, or the examination of the lubrication as the roller bearings are concealed.

Also how often and what kind and amount of lubrication should be used at a time. We all know when everything is rolling nicely we pat the inspector on the shoulder, but when something goes wrong we go right back to him and ask why he had passed this up?

MR. HEKTNER: The present instructions we have given inspectors are to observe the quantity of lubricant in the box, and we have specified a certain minimum level which is allowable. If he finds it below that level he is to add oil up to the bottom of the lowest plug. We have placed the plug at the level which we have found to be constant. If more oil is put in than up to a certain level it will not stay in the box, and will be lost through the closure.

Another point the inspector must look for is the color of the oil. He can tell by experience on examining the color and feel of the grease whether there is foreign matter in it, and also whether it has been hot at any time. The normal temperature of a roller bearing running at passenger car speed is below 100° F. I know of cases where a train has come in from a fast run with ice on the boxes. Of course the heat generated is an indication of the friction in any bearing, whether plain or roller bearing. The inspector can tell by the color of the grease whether the bearing has been over-heated. Usually when it has been running too warm there is very little grease left and it has evaporated except for a residuum. The lubricant we use is filtered winter and summer car oil. The use of car oil was the reason for our change of the design of the closure. We put in an oil flinger in order better to hold the thin oil. Grease is retained in a satisfactory way without the flinger.

MR. MILLER: The reason I raised this question was as to inter friction bearing on the inside of the wheel. We have a bearing on the inside of a wheel on a locomotive but we are having a pit for inspectors to enter in and examine it. Where the inspector inspects the cars what would be the best way to determine and detect these defects safely and economically where there is no pit?

MR. HEKTNER: You have in mind the difficulty in inspecting our inboard type of freight truck?

MR. MILLER: Yes sir.

MR. HEKTNER: Our later design has a larger opening than the first design. It is a hand hole large enough for a

man's hand. However, our object has been to eliminate the necessity for inspection, at least to separate the inspection periods as far apart as possible. Any attention that is required is a source of expense. Our inboard design involves several points that have not been worked out as yet, especially in connection with the inspection. We have tried out various devices which we found were not what we thought them to be, and with this experience back of us, we have built roller bearing trucks of various designs, all of which are giving very satisfactory service.

MR. F. G. KLASSEN: I would like to ask this, with a diner on the road 50 or 75 miles from terminal, at meal time and full of people, and the roller bearing running extremely hot, what can be done?

MR. HEKTNER: We have had a case where a cage failed. That, however, was an early design of cage that apparently did not have the proper strength—and the result of that cage failure was that the cage itself was rolled out thin between the rolls like tin foil, and the rolls still were in condition to carry the car. The inspector at the Chicago terminal discovered it and the car was run from Chicago to Milwaukee with the broken cage in it. Of course some of the rolls were damaged, one or two of them, somewhat, but at the same time the bearing carried the car.

It is not necessary to carry spare wheels and axles for roller bearings at points along the line, as the plain journal box can be substituted by means of a special filler fitting into the pedestal opening.

MR. KLASSEN: In case you had a bearing out on the road exceptionally hot what could be done with it?

MR. HEKTNER: Our instructions for treating hot roller bearing box is to fill it up with oil. I do not know of any theory to support that, but that is the method used. It seems to carry the car to destination at slow speed. We fill the box with oil.

CHAIRMAN: Are there any other questions? If not, I think we have a pretty thorough discussion of the paper and I trust we have not overlooked any questions of interest.

MR. OSCAR L. POTTER: If those cars are that easy to roll will our present braking system be sufficient to hold a

train in a mountainous country? Will our brakes hold that train without causing a sliding flat spot?

MR. HEKTNER: We have heard that question before. We have not changed the braking ratio in any car, due to the fact that the braking power is used mainly in decelerating the car. The inertia that is in the moving car possesses a kinetic energy that must be absorbed by the brakes. The difference in the friction of the plain and roller bearing of course does affect it to a slight extent, but it is small compared with the braking force required to overcome the inertia of the car.

MR. F. H. BABCOCK: Mr. Hektner has presented to this Club this evening a very interesting subject, in a new field of endeavor, which, as I gather from his remarks and the various discussions of the subject, means a longer life of railroad equipment, more safety, more service and more efficiency. I think we are indebted to Mr. Sanders for writing the paper and Mr. Hektner for his very interesting presentation of the paper and discussion of the subject. I believe this subject will be given consideration by the railway men of the country in due time, and I believe it would be entirely fitting that we give expression of our appreciation in a rising vote of thanks to these gentlemen on behalf of the Club.

The motion was duly seconded and carried by unanimous rising vote.

CHAIRMAN: If there is no further business, a motion to adjourn will be in order.

On motion, adjourned.

J. D. CONWAY, Secretary.

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FRANK E. LE GOULLON,

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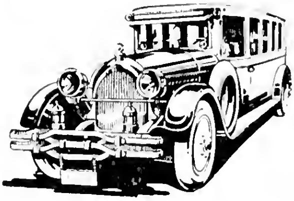


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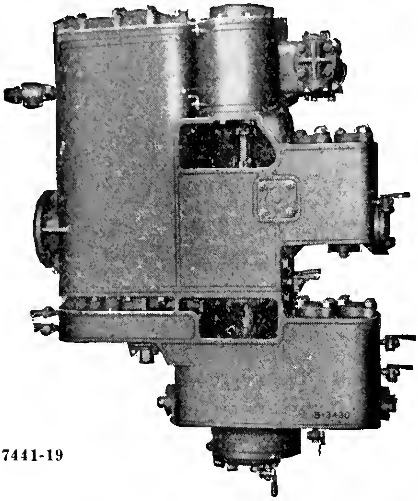

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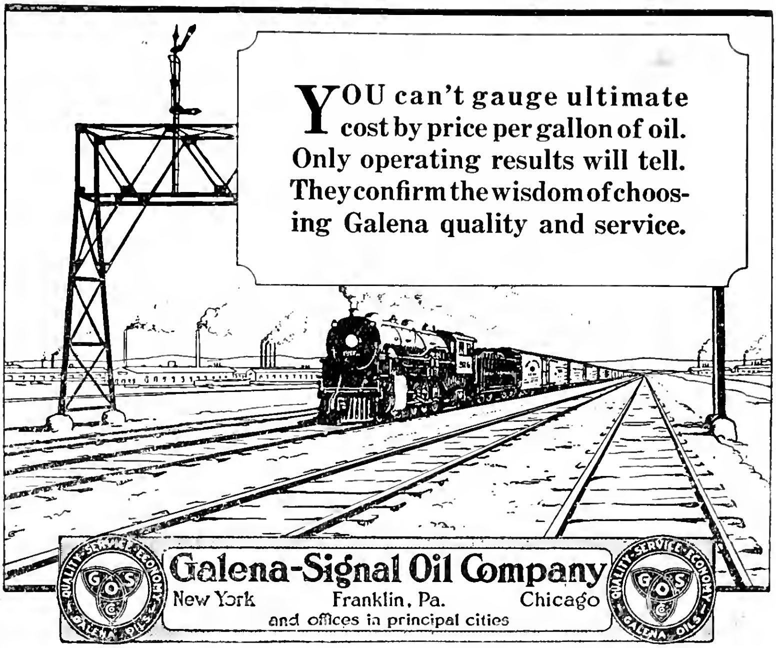
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OFFICIAL PROCEEDINGS

OF

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Vol. XXVII
No. 5.

Pittsburgh, Pa., March 22, 1928.

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Meetings held fourth Thursday of each month except June, July and August.

PROCEEDINGS OF MEETING

March 22, 1928

The meeting was called to order at the Fort Pitt Hotel at 8:00 o'clock P. M., with President E. J. Devans in the chair.

The following gentlemen registered:

MEMBERS

Abraham, W. S.
Adams, Lewis
Adams, W. A.
Allan, W. J.
Allen, E. J.
Allen, Harvey
Allison, John
Altsman, W. H.
Angstadt, Edward D.
Baker, H. M.
Barclay, James R.
Beam, E. J.
Berg, Karl
Blackwell, W. B.
Borchers, E. A.
Borg, J. E.
Bowen, James T.
Brady, T. Joseph
Braun, L. H.
Brinkhoff, W. H.
Brunner, C. H.
Burns, E. A.
Campbell, C. A.
Campbell, J. T.
Candy, A. M.
Carson, John
Chalker, A. R.
Champion, James H.
Cipro, Thomas
Clatty, John
Cohen, Alfred J.
Conway, J. D.
Cotter, George L.
Crawford, D. F.
Crenner, J. A.
Dambach, C. O.
Davis, Charles S.
Dempsey, P. W.
Devans, E. J.
Diven, J. B.
Durkin, James E.
Edwards, C. H.
Emery, E.
En Dean, J. F.
Endsley, Prof. Louis E.
Fenton, H. H.
Fisher, Harry G.
Fletcher, Albert
Frauenheim, A. M.
Freshwater, F. H.
Geisler, Johseph J.
Gibson, D. W.
Glaser, J. P.
Green, E. C.
Gunnison, W. L.
Haller, Jacob
Hamilton, William
Happ, C. R.
Harris, John P.
Herrick, A. S.
Herrold, A. E.
Hogg, Francis
Holmes, E. H.
Jones, R. I.
Karns, C. A.
Keefe, Edward A.
Kellenberger, K. E.
Helly, H. B.
King, J. W., Jr.
Klassen, F. G.
Kroske, J. F.
Kummer, Joseph H.
Lanahan, J. S.
Landis, William C.
Laurent, G. F.
Laurent, Joseph A.
Lawson, R. R.
Leckey, Ralph F.
Loeffler, George O.
Lyman, L. S.
Lynn, Samuel
MacDonald, W. C.
Matchett, H. K.
Meehan, C. L.

Millar, C. W.
Mitchell, W. S.
Morris, J. H.
Moses, G. L.
Moyer, Oscar G. A.
McLaughlin, H. B.
McNamee, W. M.
McNelty, A. P.
Nelson, W. M.
Ness, H. S.
Nichol, W. K.
Noble, J. A.
Norris, J. L.
O'Neill, Thomas J.
Oppermann, E. W.
Orchard, Charles
Painter, Joseph
Parke, F. H.
Passmore, H. E.
Post, F. H.
Prouty, E.
Rauschart, E. A.
Redding, P. E.
Reeve, George
Richardson, H. R.
Rizzo, C. M.
Rodda, G. A.
Rowland, F. S.
Rowles, L. L.
Sallinger, Howard H.
Saltic, Thomas
Sattley, E. C.
Sayre, F. N.
Schaacke, William
Seiss, W. C.
Semethy, J.
Sharp, H. W.
Shea, D. S.
Simons, Philip
Snyder, P. McK.
Souders, W. J.
Sparks, Hynes
Stebler, W. J.
Stevens, R. R.
Stewart, L. S.
Stoffregen, Louis E.
Stokes, A. H.
Sutherland, Lloyd
Sykes, A. H.
Thompson, F. J.
Torney, Michael F.
Tracy, T. W.
Trance, F.
Warren, A. T.
Watson, Claude
White, A. B.
White, Robert H.
Woods, Joseph
Woodward, Robert
Wright, John B.
Wright, O. L.
Wynne, F. E.

VISITORS

Adams, L. I.
Barny, R. J.
Bayer, Carl
Becker, W. H.
Blighton, H. J.
Block, M. C.
Braun, S. R.
Callahan, Mr.
Chamberlain, George R.
Ciscampa, J.
Dawson, A. K.
Duncan, Neil B.
Dunham, B. W.
Farfan, Robert F.
Ford, William C.
Gatchell, F. B.
Gottschalk, F. W.
Green, George J.
Grimes, Alvin
Grotts, Edino
Hackett, James E.
Harmon, F. E.
Harper, Charles W.
Henry, J. S.
Hodder, E. G.
Hogle, J. A., Jr.
Horton, H. R.
Jones, L. L.
Kelley, H. E.
Kiefer, Fred L.
Kinney, T. F.
Kirk, C. L.
Kleiser, H. E.
Knox, M. B.
Kohler, J. C.
Kusick, Harry

Lally, E. L.
Lawson, H. M.
Lewis, S. B.
Leyh, Edward L.
Lineman, A. F.
Maloney, Jos. J.
Marschall, Charles H.
Miller, L. J.
Mitchell, W. J.
Mullen, Thomas
Owens, Jerome A.
Paisley, F. R.
Palen, H. W.
Preikschat, R. W.
Prouty, R. H.
Pry, W. Henry
Rauslen, F. S.
Rosamyer, R. R.
Ross, Ted
Roush, A. E.
Roush, A. S.
Roush, Edgar A.
Ryce, E. S.
Sandler, S. H.
Schmitt, G. A.
Schneider, Fred B.
Schrontz, S. B.
Smith, Sion B.
Thomas, Dr. Phillips
Tubbs, L. G.
Turner, G. S.
Wages, W. H.
Weeks, H. J.
Welch, Edward M.

The call of the roll was dispensed with, the record of attendance being obtained through the registration cards.

The reading of the minutes of the last meeting was dispensed with as they have appeared in printed form and been distributed to the members.

The Secretary read the following list of applications for membership:

Brown, Charles L., Foreman R. R. Department, Westinghouse Air Brake Company, 666 Airbrake Avenue, Wilmerding, Pa. Recommended by P. W. Dempsey.

Callahan, F. J., Engine House Foreman, Montour Railroad, 118 Sampson Street, N. S., Pittsburgh, Pa. Recommended by E. A. Rauschart.

Cannon, J., Vice President & General Manager, Missouri Pacific Railroad Co., St. Louis, Mo. Recommended by E. J. Devans.

Cluff, Charles C., Manager of Sales, Carnegie Steel Company, 71 Broadway, New York, N. Y. Recommended by E. J. Devans.

Coates, W. T., Inspector, Westinghouse Air Brake Company, 328 James Street, Turtle Creek, Pa. Recommended by P. W. Dempsey.

Coleman, J. D., Blacksmith Foreman, Montour Railroad, 512 Seventeenth Street, Beaver Falls, Pa. Recommended by E. A. Rauschart.

Cooney, L. J., Sales Engineer, Keystone Grinder & Manufacturing Company, 220 Penn Avenue, Pittsburgh, Pa. Recommended by J. D. Conway.

Downes, M. S., Asst. to General Manager Railway Division, Timken Roller Bearing Company, Canton, Ohio. Recommended by W. C. Sanders.

Farfan, Robert F., Mechanical Engineer, Westinghouse Electric & Manufacturing Company, 716 Lamar Street, Wilkinsburg, Pa. Recommended by G. L. Moses.

Gove, William G., Superintendent of Equipment, Brooklyn-Manhattan Transit Lines, Administration Building, Gravesend Avenue, Brooklyn, N. Y. Recommended by E. J. Devans.

Hektner, Joel, Asst. Engineer, Railway Division, The Timken Roller Bearing Company, Canton, Ohio. Recommended by W. C. Sanders.

Hopkins, G. M., Foreman Boiler Shop, Montour Railroad, 715 Idlewood Avenue, East Carnegie, Pa. Recommended by E. A. Rauschart.

Huesner, R. D., Coal Freight Agent, Reading Company, Reading Terminal, Philadelphia, Pa. Recommended by E. J. Devans.

Laird, Joseph, Trainmasters' Clerk, Aliquippa & Southern Railroad, 529 Sixth Avenue, Beaver, Pa. Recommended by C. D. O'Connor.

Marshall, Rody P., Attorney, B. R. & P. Ry. Co., 512 Fourth Avenue, Pittsburgh, Pa. Recommended by John G. Whitmore.

Moreland, Evan L., Machine Shop Foreman, Montour Railroad, 1215 Hiland Avenue, Coraopolis, Pa. Recommended by E. A. Rauschart.

Newman, S. S., President, Keystone Grinder & Manufacturing Company, 220 Penn Avenue, Pittsburgh, Pa. Recommended by J. D. Conway.

Owen, A. T., Superintendent Transportation, Reading Company, Reading Terminal, Philadelphia, Pa. Recommended by E. J. Devans.

Pickard, Frank C., Works Manager, The Standard Stoker Company, Inc., 30 General Robinson Street, N. S., Pittsburgh, Pa. Recommended by L. V. Stevens.

Porter, P. P., Foreman Air Brake Department, Montour Railroad, 134 Jackson Street, Bellevue, Pa. Recommended by E. A. Rauschart.

Purnell, Charles G., Inspector, Metallurgical Department, Carnegie Steel Company, Frick Annex Building, Pittsburgh, Pa. Recommended by J. A. Ralston.

Sallinger, Howard H., Rate Clerk, B. & O. R. R., 3114 Niagara Street, Oakland, Pittsburgh, Pa. Recommended by J. T. Campbell.

Steigerwalt, Robert W., Inspecting Engineer, Carnegie Steel Company, Frick Annex, Pittsburgh, Pa. Recommended by J. A. Ralston.

Watson, Claude, Passenger Conductor, B. R. & P. Ry., Springville, N. Y. Recommended by E. J. Devans.

Welch, E. M., Service Engineer, Dearborn Chemical Company, 701 Mifflin Avenue, Wilkinsburg, Pa. Recommended by J. A. Crenner.

Wilkinson, E. W., Inspector, Westinghouse Air Brake Company, 512 Airbrake Avenue, Wilmerding, Pa. Recommended by P. W. Dempsey.

PRESIDENT: These applications will be referred to the Executive Committee, in accordance with our By-Laws, and upon approval by them, the gentlemen will become members without further action.

SECRETARY: We have received information since our last meeting of the death of two of our members, Mr. Samuel Zimmerman and Col. John M. Milliken.

PRESIDENT. An appropriate memorial minute will appear in the next issue of the Proceedings.

Is there any further business? If not, this brings us to the pleasant part of our program. I shall not attempt to tell you the good things in store for you, but I take pleasure in introducing to you Dr. Phillipps Thomas, Research Engineer of the Westinghouse Electric & Manufacturing Company, who will speak to you on the subject, "Some By-Products of Radio."

SOME BY-PRODUCTS OF RADIO

By Phillipps Thomas, Ph.D., Research Engineer,
Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

Gentlemen of the Railway Club of Pittsburgh and Guests:

Every new art, as it is developed, brings to light a number of new phenomena.

Also the appliances produced for practicing the new art, are often found to have very desirable applications in other arts already operating with acceptable success.

This class of phenomena and the other uses of the appliances of an art are commonly spoken of as its "by-products."

It is my purpose tonight to direct your attention to some radio "by-products."

In the practice of the radio art no other appliance, or device, plays so important a part as the vacuum tube. Without the vacuum tube we would have none of our modern radio broadcasting; little, or no radio telephoning; and no transcontinental or transoceanic telephoning by wire or radio. The importance of the vacuum tube has been generally recognized and has caused a great amount of time to be devoted to studies of it.

The result of this study is evidenced by a large variety of vacuum devices each having some outstanding feature of its own.

The Radio Tube

The radio tube, so called because of its great use in that art, has three principal functions: (1) that of a converter of alternating current to direct current; (2) the inverse operation of converting direct current to alternating current, and (3) that of an amplifier of voltage or power.

As a converter of alternating currents to direct currents—that is, as a rectifier—the alternating currents may be of any frequency. And in the conversion from direct current to alternating current the latter may have any desired frequency.

As an amplifier the tube and its accessories make feeble currents strong. A striking part of this strengthening action is the remarkable fidelity that is maintained in the strengthened electric current even though it is increased many thousands or even millions of times.

We often think of the microscope as the ultimate means of magnification, but with it, we are limited to a few thousand diameters as the practical range of its usefulness as an amplifier of light images. The vacuum tube amplifier goes up into the millions of times before it reaches its limit. However, to avoid any misunderstanding, it should be stated that the amplification of millions of times, is obtained by using several tubes arranged in sequence so as to secure several stages of amplification. This cascading is not possible with the microscope because of limitations of light but is possible in the case of the tubes because additional energy is supplied at each stage in the building-up operation. In the average arrangement, the amplification of voltage per stage is of the order of 10 to 20 times.

What I've described thus far relates principally to the more nearly standard radio tube. A few of the by-product types,

that we will attempt to demonstrate for you, will be explained briefly during the demonstration.

The Radio Power Generator

In this demonstration oscillations will be produced by means of a vacuum tube, and accessories, of a proper frequency to cause standing waves in a pair of electric conductors placed near to the generating circuit.

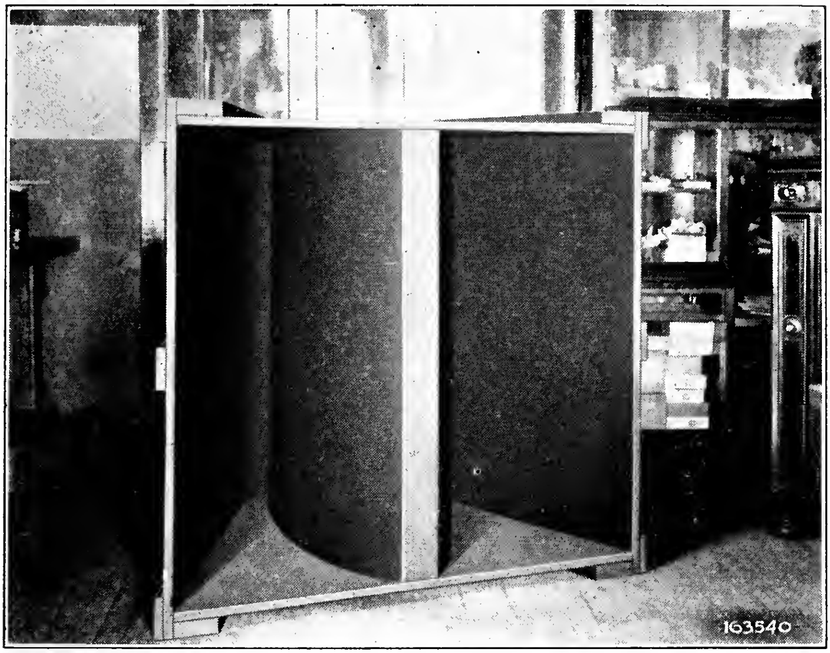
With the oscillation generator operating the existence of the standing waves is readily made manifest by finding nadal points of maximum voltage difference.

Dr. Phillips Thomas operating a 12 watt radio pickup from a 35 watt oscillator.

By using a tube containing Neon gas of a critical pressure. these nadal points are indicated by the glowing tube. In place of a tube a small incandescent lamp can also be used. It will be seen that these points are about a meter apart, as this represents a half wave length, the frequency is readily determined to be about 150,000,000 cycles per second. That seems like a tremendously rapid change in direction of the current back and forth every second when compared with the ordinary house lighting current frequency of 60 per second.

But when compared to the frequency of light waves it is very slow, for yellow light has a frequency approximately 4 million times as great. There does not seem to be much hope then of getting frequencies directly by this means for light production.

The tube acts as a generator of oscillation because its power circuit and its control circuit are so related as to effect an energy transfer from one of the other at certain times. This condition is controlled by the values of the constants of the two circuits.



Exponential horn invented by C. R. Hanna and J. R. Slepcan, Research Engineers.

These same factors also determine the frequency of the oscillations.

It is interesting to note that there is a certain amount of space radiation taking place as can be seen by exploring with a simple straight wire with a miniature lamp inserted in the middle to indicate, by its filament lighting, when current is passing.

High frequency currents of a considerable lower order of frequency, however, are being used successfully for telephoning over high tension power lines while the lines are operating normally in transmitting power at very high voltages.

They are also used on the trunk lines of the telephone company's service to increase the carrying capacity of existing lines for long distance communications. Thus one pair of wires may carry half a dozen different conversations simultaneously without the slightest trace of confusion.

Auditorium Loud Speaker

As an amplifier the vacuum tube is used in long distance telephone service to build up the strength of the feeble voice currents at intervals of 40 or 50 miles. By this means conversation from coast to coast is entirely satisfactory. The voice

C. R. Hanna, one of thre inventors, in his laboratory. The element in the foreground is the one used in conjunction with the powerful exponential horn.

even though amplified many times as it passes through the several booster stations, is readily recognizable with all of the characteristics that identify one voice from another.

Another use of the vacuum tube amplifier is in the talking movie art. Here it is necessary to build up exceedingly feeble currents to a strength sufficient for a loud speaker.

This application promises to assume considerable importance in this new art now just at the beginning.

Still another application of the tube as an amplifier is in what is termed the auditorium loudspeaker.

This is in effect an electrically operated phonograph. The object sought is improved quality of reproduction and increased volume. Such an apparatus is expected to be a competitor of orchestras in hotels—clubs—theaters—dance halls—parks—and in time may be used for church services. This apparatus resulted from efforts to improve radio loud speakers. We will play a small part of each of several records to give you an idea of its range of application.

Photo-Glow Tube

While engaged in an effort to make a regulating tube, one that would not permit the voltage to exceed a certain determined amount—it was observed that the voltage at which certain tubes operated varied with the day. On bright days it was lower than on dark ones. An investigation of the cause was begun and the tube that we will now demonstrate resulted.

It was found that the materials employed in the tube had photo-electric properties. In other words, it was found that if a voltage be impressed upon the two terminals of the tube no current would pass if the tube was kept in darkness, but if it was subjected to light it passed a small current. If the light was made sufficiently intense the amount of current passed would ionize the gas and thus permit the passage of a comparatively large current, enough, without amplification, to operate a sturdy relay.

It will be observed here that when this tube is illuminated it operates and in this arrangement lights a lamp. The lamp goes out as soon as the illumination is removed which can be done either by withdrawing the light, or by screening it with my hand.

Numerous applications of contactless relays will suggest themselves as places where such a device can be utilized.

Grid-Glow Tube

Following up certain phenomena that were suggested by a study of the preceding device Mr. Knowles—the inventor of the preceding as well as the device about to be described—found it possible to add another electrode in a particular way so as to secure quite remarkable control of the operation of the tube. This device known as the Knowles Grid-Glow Tube is quite similar in size and general appearance to a radio tube.

It differs principally in that it has no heated electrode and

also in that it contains a gas. When a voltage of about 400 is impressed between its anode and cathode and the grid is left disconnected—no current will pass as the grid accumulates a charge from some of the free electrons and blocks operation of the tube. If, however, the charge is removed from the grid the tube operates and passes sufficient current to operate a relay which in turn will close, or open a circuit that can be made to operate any suitable electrical device.

If an alternating current is impressed upon the tube the

D. D. Knowles, Research Engineer, inventor of the Knowles Tube.

grid can be discharged by means of a small condenser. Such a condenser can be formed by a sheet metal connected to the grid as one plate and the hand of an individual as the other. The ratio of energies in the control and operating circuits are of the order of 1 to 100,000,000. The usual relay has a corresponding ratio of 1 to 1,000. This tube gives the greatest degree of amplification of any device thus far developed.

In the set we will demonstrate for you, the inner surface of this sphere is connected to the grid of the tube and upon my hand being brought near to, but not touching, the sphere, the tube will operate and close a circuit which in this case, contains a small electric sign.

This particular set has a special historical interest in that it is the identical one used by the late Judge Gary to start up the Homestead Steel Works' new electrical mills from his office in New York. This operation was the same as the one I've just shown you for lighting the sign excepting that in place of the sign the tube controlled a radio transmitter whose signal was picked up in Homestead and which there, on being amplified, operated a relay which closed the circuit and started up the great mills.

I regret the necessity of making my story so sketchy but I thought you would be more interested in seeing more demonstrations than in hearing more details of a smaller number.

It is a great pleasure to me to tell of the many new things we are doing and I judge from your generous reception of what has been presented that you share with me the thought that we are doing a good job.

PRESIDENT: Dr. Thomas, I assure you we have all enjoyed this talk and we regret very much that you had to stop so soon.

I might say that Dr. Thomas has said that he would be very glad to answer any questions that you may wish to ask.

DR THOMAS: I will be very glad to show the apparatus at close range and play any additional records you wish after the meeting.

PRESIDENT: Professor Endsley, will you start the questioning?

PROFESSOR LOUIS E. ENDSLEY: I am sure I am of the opinion of a great many more here this evening, that we have enjoyed this very, very much. And I know that the men who made this demonstration possible have had more fun out of it than anybody in this hall. That is why I look at it as being a great privilege to be a research man.

I do not know that I have any questions. There are so many things that I do not know about this that I do not like to show my ignorance. One thing I would like to ask. I think the average layman might get a wrong impression from the

statement that the little tube amplifies sound a million times, or whatever it may be. That is merely a change of voltage in some other larger current, which makes that possible.

But I do want to say that this talk tonight has brought out that it is possible to do things in the railway field now that seemed impossible a few years ago.

DR. THOMAS: You are right in saying that no individual vacuum tube is able of itself to take a small signal and amplify it a million times and put it out. What we do is to take one tube and amplify it a little and then take that amplified signal and amplify it a little more. Just as though we had a lot of microscopes in series and we were able to add additional light in each step.

PRESIDENT: Mr. Crawford, have you something to ask?

MR. D. F. CRAWFORD: I am puzzled myself by the many interesting things I have seen so that I hardly know what question to start with. What has appealed to me most in the Doctor's talk is his splendid explanation of the things that have been made possible by the development from such a small start as the small vacuum tube. As I understand it, you are able to make tubes now, based on the same principles as the small tube which have a capacity of in the neighborhood of ten kilowatts.

DR. THOMAS: Forty.

MR. CRAWFORD: That is to say it is possible for you to send out radio waves of a power of forty kilowatts with one tube. I also understand that this type of tube is now largely used by the railways in connection with the so-called train control or automatic stop system. Therefore it would seem that you have not only given us an explanation of what the tube will do in music and other particulars, but have shown a very practical use of it for the railway men who have come here tonight.

PRESIDENT: Mr. Orchard, what can you add?

MR. CHARLES ORCHARD: I was going to ask Dr. Thomas if there is anything back of the Victrola in addition to just simply the needle pressing in the lines on the record?

DR. THOMAS: That is all:

MR. ORCHARD: And these other lamps are connected up with a battery?

DR. THOMAS: Just like your own radio sets, only they are of a little more power than you have in the ordinary radio set.

PRESIDENT: Mr. Henry, of the Safety Car Heating and Lighting Co., of New York, you ought to know something of interest about this.

MR. J. S. HENRY: I do not believe I have any questions, thank you. It is a little bit over my head. It is very interesting.

MR. A. K. DAWSON: I would like to ask a very foolish question. Is that the same sort of loud speaker they use for any home radio set?

DR. THOMAS: Oh, yes, surely. But I would not advise you to try it. We have trouble enough now to get the wife to let us bring in what we want with our radio.

PRESIDENT: Mr. Passmore?

MR. H. E. PASSMORE: What is it you wish of me?

PRESIDENT: We want you to say something.

MR. PASSMORE: I could talk if I knew what to talk about. But I do not know anything at all about this. I am like Mr. Henry, it is away over my head. I have a radio set. I don't know anything about it and I am not going to try to learn anything about it except to turn the knobs. I have troubles enough now.

SECRETARY: I think possibly Mr. Samuel Lynn, in the back part of the room, might know something about it.

MR. SAMUEL LYNN: Contrary to the other speakers, I know so much about it that I do not want to say anything about it.

PRESIDENT: We have a man from the Ground Hog City who claims he knows a lot about Radio, Mr. A. B. White.

MR. A. B. WHITE: In following this discussion and after witnessing this demonstration, there is one thing that has been running in my mind, and that is the amplification of the whistle

to such an extent as to blow the automobiles off the track or possibly scare the people into being more careful. I will not attempt to start anything as I may touch the wrong tube. I assure you that I have enjoyed this exemplification very much and am mighty glad to have been here tonight.

DR. THOMAS: You know we have only 40 k.w. power available per tube and I do not think that would be enough to scare anybody off the railroad track who was fool enough to go on there in the first place.

PRESIDENT: Mr. Candy, of the Westinghouse Electric.

MR. A. M. CANDY: Mr. Chairman, I am rather surprised to be called on to speak this evening as I had not expected to be requested to make any remarks about a subject with which I am so little acquainted, as the subject which Dr. Thomas has been presenting this evening. I am sure that we have all been very keenly interested in the remarks made by Dr. Thomas and the demonstrations which he has given to us. There is however, one question which I would like to ask Dr. Thomas if I may. Dr. Thomas mentioned equipping garage doors with one of his glow tubes so that when the attendant drives up at night and allows his head-lights to flash through a small aperture onto the glow tubes the garage doors would automatically open. I am wondering if Dr. Thomas has worked out the application whereby such tubes could be connected to the door latch mechanism of the home so that when certain gentlemen come home late at night all "lit up," the doors would automatically open and allow them to enter without hunting for the key-hole? If Dr. Thomas should work out this application for the benefit of mankind, he would then be compelled to help out the housewife by getting in touch with Mr. Wensley and developing a mechanical woman the same as he has now developed a mechanical man, so that the mechanical woman could be located inside the door and automatically wallop the gentleman over the head with the rolling-pin when he comes through the doors which have been automatically opened for him.

DR. THOMAS: I do not know anything about hunting for key holes or about rolling pins, so I am afraid I can not answer that.

PRESIDENT: Has any one else anything to add?

DR. THOMAS: There is one more rather interesting thing

that I might describe. One of the problems connected with the operation of the Holland Tubes from New Jersey to New York is to speed up the traffic through the tunnels to get a proper amount of revenue. The dyed-in-the-wool New Yorkers, and New Jersey people, will go through the tunnels at the required speed. They want them to go through the tunnels at about 40 miles an hour, because they charge 50c apiece. But the tourists travel through there at about 25 miles an hour and that cuts down revenues perhaps as much as $1,000 a day. They have experimented with putting a traffic cop through every three or four minutes and telling the drivers to follow them. But that only holds for two or three cars and has not been very successful. You remember I showed you a light that shone at this point and at that point? We can develop that so these lights will be spaced the distance they want between cars, and by certain manipulation we can make the lights move along these wires, and fix it so that when cars come to the New York end they will read a sign saying: "Pick your light and keep up with it," and they will have an apparent succession of lights going through those tunnels separated by about 75 feet and running 40 miles an hour, and that will add a lot to the revenue

PRESIDENT: Mr. Sattley, may we hear from you?

MR. E. C. SATTLEY: There has been so much that I did not understand that I am inclined to ask a very foolish question myself. Is there another side to that record "Two Black Crows?"

DR. THOMAS: Yes, and it is even more foolish than the side you heard.

MR. SATTLEY: Will you give it to us?

(Dr. Thomas then ran a number of other records through the loud speaker, to the very great delight of the audience.)

MR. CRAWFORD: I have asked about all the questions that have occurred to me and therefore I would like to move that the Club offer a vote of thanks to Dr. Thomas, not only for a very instructive lecture, but I believe we will remember his excellent explanation of the things we have seen this evening many times as we see future development.

The motion was duly seconded and carried by unanimous rising vote.

PRESIDENT: If there is nothing further to come before the meeting, the usual lunch will be served in the adjoining room and I will declare the meeting adjourned without asking for a formal motion.

J. D. CONWAY, Secretary.

In Memoriam

SAMUEL ZIMMERMAN
Died, January 1, 1928

JOHN M. MILLIKEN
Died, March 2, 1928

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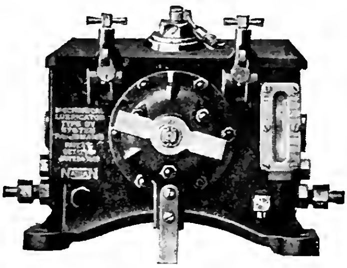

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OFFICIAL PROCEEDINGS

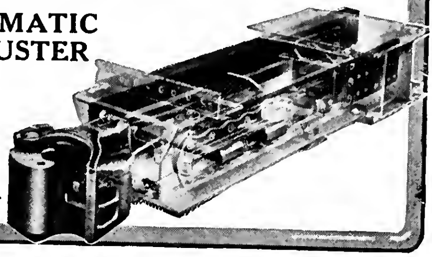
RAILWAY CLUB OF PITTSBURGH

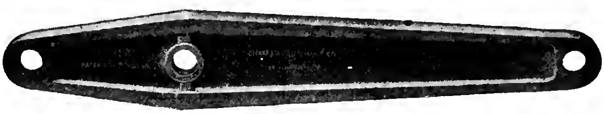
$1.00 Per Year — 25¢ Per Copy

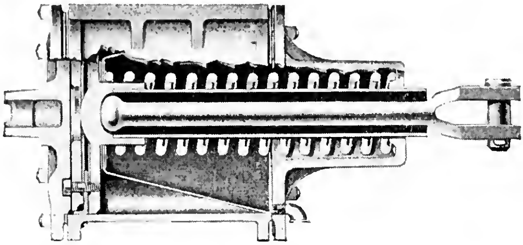
Vol. XXVII — APRIL 26, 1928 — No. 6

THE USE OF COPPER BEARING STEEL IN RAILROAD STEEL FREIGHT CARS

By DR. J. S. UNGER, Manager, Central Research Bureau, Carnegie Steel Co., Pittsburgh, Pa.







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OF
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No. 6.
Pittsburgh, Pa., April 26, 1928.
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Meetings held fourth Thursday of each month except June, July and August

PROCEEDINGS OF MEETING

April 26, 1928

The meeting was called to order at the Fort Pitt Hotel at 8:00 o'clock P. M., with President E. J. Devans in the chair.

The following gentlemen registered:

MEMBERS

Adams, L.
Ainsworth, J. H.
Allen, E. J.
Allison, John
Altsman, W. H.
Ambrose, W. F.
Ahston, William A.
Barclay, James R.
Beam, E. J.
Blest, M. C.
Bonhoff, E. L.
Brunner, C. H.
Campbell, J. T.
Cannon, T. E.
Christy, F. X.
Clatty, J. H.
Coates, W. T.
Conway, J. D.
Coulter, A. F.
Crawford, D. F.
Dambach, C. O.
Davis, Charles S.
Devans, E. J.
Durkin, James E.
Emery, C. W.
Emery, E.
En Dean, J. F.
Endsley, Prof. Louis E.
Fisher, Harry G.
Frauenheim, A. M.
Fults, J. H.
Gilg, Henry F.
Givler, H. C.
Glenn, J. H.
Gordon, George A.
Gorman, P. F.
Gunnison, Walter
Hackett, C. M.
Haller, Jacob
Hamilton, William
Hansen, William C.
Haskell, B.
Henry, Frank P.
Hiner, L. D.
Holmes, E. H.
Hood, J. M.
Hoover, R. C.
Horner, William
Hussong, Jr., A. C.
Jack, Arthur C.
Kennedy, W. R.
Knox, William J.
Kroske, J. F.
Lawson, R. R.
Laurent, G. F.
Leonard, C. W.
Lobez, P. L.
Ludgate, B. A.
Lustenberger, L. C.
Lynn, Samuel
Matchett, H. K.
Millar, C. W.
Miller, John
Moulis, F. J.
Muir, R. Y.
McAbee, W. S.
McKee, S. Frank
McLaughlin, H. B.
McNamee, W.
Ness, H. S.
Orchard, Charles
O'Sullivan, J. J.
Painter, Joseph
Parke, F. H.
Provost, S. W.
Ralston, J. A.
Rauschart, E. A.
Reynolds, D. E.
Rizzo, C. M.
Rogers, Robert
Sallinger, Howard H.
Sattley, E. C.

Schaacke, William
Severn, A. B.
Shellenberger, H. M.
Shelton, F. M.
Sheridan, T. F.
Shriver, W. W.
Simons, Philip
Spielmann, J. A.
Stark, F. H.
Stevens, R. R.
Stucki, A.
Suckfiield, G. A.
Sutherland, Lloyd
Sykes, A. H.
Tate, R. G.
Thompson, F. J.
Tipton, G. M.
Trance, F.
Tucker, John L.
Unger, J. S.
Vandivort, R. E.
Van Vranken, S. E.
Walther, G. C.
Wheatley, William
White, A. B.
Williams, A. G.
Wolford, Jesse J.
Woodward, R.
Wright, O. L.
Young, F. C.
Zilian, R. F.

VISITORS

Canfield, L. T.
Carrick, G. S.
Chamberlain, George R.
Coffin, C. W. Floyd
Davey, W. E.
Davis, William B.
Eckels, W.
Fay, T. J.
Fogg, T. Z.
Forrester, J. B.
Greener, E. R.
Harvey, J. H.
Lockridge, Ted.
Parry, William J.
Pugh, A. J.
Schmitt, G. A.
Shaw, John A.
Soles, William H.
Story, Edward B.
Tate, Paul R.
Treher, Earl W.
Van Arsdale, G. T.
Wickerham, F. A.

The call of the roll was dispensed with, the record attendance being obtained through the registration cards.

The reading of the minutes of the last meeting was dispensed with as they have appeared in printed form and been distributed to the members.

The Secretary read the following list of applications for membership:

Beck, Carl H., General Sales Manager, Westinghouse Air Brake Company, Wilmerding, Pa. Recommended by G. W. Wildin.

Coffin, C. W. Floyd, Vice President, Franklin Railway Supply Company, Inc., 17 East 42nd Street, New York, N. Y. Recommended by J. D. Conway.

Hancock, Milton L., Office Engineer, Westinghouse Air Brake Company, Wilmerding, Pa. Recommended by G. W. Wildin.

Roush, Albert S., Superintendent Telegraph, P. & L. E. R. R., 6735 Thomas Boulevard, Pittsburgh, Pa. Recommended by J. E. Hughes.

Sample, W. E., Supervisor Locomotive Operation, B. & O. R. R., Pittsburgh, Pa. Recommended by J. L. Norris.

Stiver, Joseph R., Conductor, B. R. & P. Ry., 126 Ridge Avenue, Punxsutawney, Pa. Recommended by E. J. Devans.

PRESIDENT: These applications will be referred to the Executive Committee, in accordance with our By-Laws, and upon approval by them, the gentlemen will become members without further action.

The Secretary read an invitation from the American Society of Mechanical Engineers to the members of this Club to attend their Spring meeting to be held in Pittsburgh May 14-17, 1928. Also announced the lecture and pictures to be given at the Fort Pitt Hotel, Friday evening, May 4, 1928.

PRESIDENT: If there is no further business to be brought up at this time, we come to the paper of the evening, the title of which is "Effects of Copper Bearing Steel in Freight Cars," by Dr. John S. Unger, manager of the Central Research Bureau of the Carnegie Steel Company. As Dr. Unger is one of our oldest members I will not attempt to introduce him. Dr. Unger.

THE USE OF COPPER BEARING STEEL IN RAILROAD STEEL FREIGHT CARS

By DR. J. S. UNGER,

Manager, Central Research Bureau, Carnegie Steel Co., Pittsburgh, Pa.

About 20 years ago a few investigators observed that certain steel sheets, which were made by the same process, showed considerable differences in resistance to atmospheric corrosion. The ordinary chemical analyses regularly made for the four common elements, Carbon, Manganese, Phosphorus and Sulphur, showed little difference in their composition. On making more complete analysis, determining the presence of other than the usual elements, it was found that small amounts of Copper were present in those sheets which were corroded the least.

Such findings were amplified by making steel sheets by

the same method, but adding small amounts of Copper to certain ingots of the same heat, then rolling into sheets, afterwards exposing both kinds of unprotected sheets to the atmosphere and noting the relative difference in corrosion.

Up to this time there had been a metallurgical tradition to the effect that steel containing copper was redshort and of poor quality. This tradition had been believed by many metallurgists, who had prepared specifications in which the steel was rejected if it contained above a certain low percentage of copper. When copper was added to steel, it appeared to be a display of metallurgical ignorance to deliberately add a supposedly injurious element.

This same belief was not alone true of Copper, but similar experiences have been met with in the traditions regarding other elements, notably Phosphorus and Sulphur.

It has been estimated that the loss from rusting * amounts to $300,000,000 annually in the United States. The railroads, being large users of steel, share a considerable part of this loss. Among the items affecting their losses from rust, the steel freight car is one of the most important.

The life of the steel freight car is dependent upon several factors, among which are mechanical abrasion and corrosion. The character of the loads carried governs the destruction of the car body by mechanical abrasion, and may also affect the corrosion to some extent. Regardless of the loads carried, the cars are subjected to atmospheric corrosion, which in conjunction with mechanical abrasion, will finally cause the destruction of the car body. Very little can be done to reduce the mechanical abrasion, consequently, efforts to increase the life of the car body must be confined to reducing the losses due to corrosion.

As a result of the experiences with small amounts of Copper in roofing sheets, the Bessemer & Lake Erie Railroad, early in 1914 decided to try Copper Bearing steel in the bodies of some of their steel freight cars to determine the effect on the life of the car.

As no two cars are used under exactly the same condition of service, and the life of the individual car is largely dependent upon the service to which it has been subjected, it is necessary when comparing different kinds of steel to make the trial in the same car.

*F. M. Farmer, President, A. S. T. M.—Presidential Address, 1925.

In order to make this test comparative and of sufficient magnitude to give definite information, the Bessemer & Lake Erie Railroad ordered 100 hoppers and 100 gondolas to be built, using Copper Bearing steel in one half the body and plain steel in the other half of the same car.

Description of Cars

Both the hoppers and gondolas were of 100,000 lbs. capacity. The side and end plates in both kinds of cars were ¼-inch thick. The floor plates in the gondolas, and the floor in the hopper and hood cover plates in the hoppers were 5/16" thick. The center sill cover plates in the gondolas, and the drop door cover plates in both kinds of cars were ⅜" thick. It will be noted that some of these plates were thicker than ordinarily used, but as both kinds of steel were of the same thickness, the test was truly comparative.

The plain steel was Basic Open Hearth steel of approximately .18 Carbon, and the Copper Bearing steel was Basic Open Hearth steel of a similar Carbon content with .40% Copper.

Service Obtained

The cars were placed in service during October, 1914, and to date have been in service for about 13½ years. All the cars are still in service with the exception of a few that are laid up for repairs.

The condition of these cars has been carefully observed by both the Bessemer & Lake Erie Railroad and the Carnegie Steel Company during the period they have been in use. It has been difficult to make an inspection of a great many of the cars at any one time, due to the fact that the cars are widely distributed over the Bessemer & Lake Erie road and also on connecting lines.

The first inspection was made after the cars had been in service about two years. This inspection showed the characteristic differences between the Copper Bearing and the Plain Open Hearth steel that are usually found when comparative atmospheric corrosion tests are made of the two kinds of steel under the same conditions. The unpainted surfaces of the Plain steel was of a light, yellowish brown color, with loosely adhering rust. The Copper Bearing steel was of a dark, reddish brown color, with a dense, tightly adhering coat-

ing of rust. The Plain steel was pitted to a greater extent, and the pitting was much deeper than on the Copper Bearing steel. The most noticeable difference in the two kinds of steel at the end of two years service was the condition of the paint. The paint was adhering much better to the Copper Bearing steel than it was to the Plain steel in similar locations in the same car.

The difference in the adherence of the paint was borne out by all subsequent annual inspections of the cars. After the cars had been in service sufficiently long, it was an easy matter for anyone not familiar with these cars to decide which was Copper Bearing steel and which was Plain steel, simply by the condition of the coating of paint. In many cases the Copper Bearing steel would be well protected by the paint, while practically no paint remained on the Plain steel in similar locations. This resulted in the Plain steel being corroded to a greater extent on the outside of the car body than the Copper Bearing steel, as indicated by considerably more and deeper pitting on the Plain steel.

The influence of the two kinds of steel on the adherence of the paint has also been a factor in the cost of maintenance. In many cases cars had to be repainted simply because of the failure of the paint coating on the Plain steel portion, while all the cars had to be repainted more frequently than would have been necessary if the bodies had been built entirely of Copper Bearing steel.

After the cars had been in service for six years, measurements were made of the thickness of the plates in similar locations in four separate cars.

Table "A" gives the results of the measurements. It will be noted the average results at this time showed that the Copper Bearing steel had lost 8% of its original thickness, while the Plain steel in similar locations had lost 18% of its thickness.

TABLE "A"

	Original Thickness Inches	Copper Bearing Steel Thickness End of 6 Years Inches	Percentage of Loss	Original Thickness Inches	Plain O. H. Steel Thickness End of 6 Years Inches	Percentage of Loss
Gondola 14105						
Floor Plate	.313	.287	8	.313	.256	18
Side Plate	.250	.237	6	.250	.220	12
Gondola 14124						
Floor Plate	.313	.285	9	.313	.250	20
Side Plate	.250	.240	4	.250	.225	10
Gondola 14190						
Floor Plate	.313	.270	13	.313	.230	26
Side Plate	.250	.240	4	.250	.225	10
Hopper 41035						
Divide Sheet	.250	.220	12	.250	.170	32

Average loss of copper-bearing steel, 8%: average loss plain O. H. steel, 18%.

Measurements taken at subsequent inspections showed that in every case the Plain steel was considerably thinner than the Copper Bearing steel. Where abrasion has been a more important factor than corrosion as in the side hopper sheets, the relative difference in the loss in thickness has not been as great as when the comparison is made between the two steels in a location where there has not been as much abrasion as in the side sheets of the gondolas. In the latter case corrosion has been more of a factor and the Copper Bearing steel shows a greater superiority than it does in the side hopper sheets of the hoppers.

This is shown in Tables "B" and "C", which give the average thickness of the two kinds of steel in similar locations in the same cars after 13 years service.

TABLE "B"

COMPARISON OF LOSS IN THICKNESS OF PLAIN OPEN HEARTH AND COPPER BEARING STEEL IN SIMILAR LOCATIONS IN THE SAME CARS AFTER 13 YEARS SERVICE

	Original Thickness Oct., 1914. Inches	Copper Bearing Steel Thickness October, 1927. Inches	Plain Open Hearth Steel Thickness October, 1927. Inches
Side Sheet Gondola	.250	.220	.178
" " "	.250	.203	.128
" " "	.250	.230	.150
" " "	.250	.231	.179
" " "	.250	.230	.148
" " "	.250	.210	.170
Average Thickness	.250	.220	.159
Loss in Thickness		.030	.091
Percent Loss		12%	36%

Using the loss in thickness for the Plain Open Hearth steel as 100%, the Copper Bearing steel lost only 33% as much thickness in similar locations.

TABLE "C"

COMPARISON OF LOSS IN THICKNESS OF PLAIN OPEN HEARTH AND COPPER BEARING STEEL IN SIMILAR LOCATIONS IN THE SAME HOPPERS AFTER 13 YEARS SERVICE

	Original Thickness Oct., 1914, Inches	Copper Bearing Steel Thickness October, 1927, Inches	Plain Open Hearth Steel Thickness October, 1927, Inches
Outside Hopper Sheet	.313	.180	.165
" " "	.313	.200	.140
" " "	.313	.215	.100
" " "	.313	.220	.115
" " "	.313	.205	.160
" " "	.313	.220	.175
" " "	.313	.232	.107
" " "	.313	.230	.135
" " "	.313	.220	.130
" " "	.313	.220	.110
Average Thickness	.313	.214	.134
Loss in Thickness		.099	.179
Percent Loss		32%	57%

Again using the loss in thickness for Plain Open Hearth steel as 100%, the Copper Bearing steel lost 55% as much metal as the Plain steel.

The results with the two kinds of steel in the hoppers were further confirmed by work done by the Bessemer & Lake Erie Railroad. Hopper 41071 was returned to the shops after 13 years service for general repairs, which included replacement of a number of the plain steel sheets. While it was not necessary to remove the Copper Bearing steel in similar locations at this time, the Bessemer & Lake Erie officials removed the cross hood and diaphragm, inside hopper sheets, outside hopper sheets, center floor plates, intermediate side sheets and the side floor sheets of both kinds of steel. These sheets were then carefully cleaned and weighed to determine the loss in weight. Table "D" gives the relative loss of weight for the two kinds of steel in similar location in the same car.

TABLE "D"

COMPARISON COPPER BEARING AND PLAIN OPEN HEARTH STEEL REMOVED FROM BODY OF A STEEL HOPPER CAR AFTER 13 YEARS SERIVICE.

Data Furnished by B. & L. E. R. R.

	Original Weight Oct., 1914. Pounds	Weight After 13 Years Pounds	Loss in Weight Pounds	Loss in Weight Pct.
Cross Hood & Diaphragm—Plain Steel	796.6	422.5	374.1	46.9
Cross Hood & Diaphragm—Copper Steel	796.6	506.5	290.1	36.4
Inside Hopper Sheets—Plain Steel	256.9	139.5	117.4	45.7
Inside Hopper Sheets—Copper Steel	256.9	161.5	95.4	37.1
Outside Hopper Sheets—Plain Steel	324.8	163.0	161.8	49.8
Outside Hopper Sheets—Copper Steel	324.8	231.5	93.3	28.7
Center Floor Sheet —Plain Steel	144.7	80.5	54.2	44.4
Center Floor Sheet —Copper Steel	144.7	108.0	36.7	25.4
Intermediate Side Sheet—Plain Steel	516.8	263.5	253.3	49.1
Intermediate Side Sheet—Copper Steel	516.8	468.5	48.3	9.3
Side Floor Sheets —Plain Steel	1330.9	795.5	535.4	40.2
Side Floor Sheets —Copper Steel	1330.9	973.5	357.4	26.8
Total —Plain Steel	3370.6	1864.5	1506.1	44.7
Total —Copper Steel	3370.6	2449.5	921.1	27.3

It will be noted the loss in weight for the Copper Bearing steel was 61% as much as the Plain steel. This is in fairly close agreement with the relation found when the losses were determined by measuring the thickness of the side hopper sheets as shown on Table "C".

Most of the hoppers have now been in service long enough to require general body repairs. These repairs are in such places where the mechanical abrasion and corrosion have been most severe. In cases where the repairs have consisted of patches put on over the original steel, as on the bottom of the side hopper sheets, the patches in many cases have been put on over both kinds of steel. Examination of the edges of the steel sheets under such patches show that the Plain steel has been worn to a ragged, knife-like edge, while the Copper steel in the same location would be 1/8" or over in thickness. This indicated that while it was necessary to patch the Plain steel, the Copper Bearing steel would have lasted much longer, but the shops considered it cheaper to make repairs to both kinds of steel at one shopping of the car.

This has not been the case where the cars were given extensive repairs. During the last inspection one gondola car was examined in the shops in which the Plain steel end had been replaced, while no replacement was necessary in the Copper Bearing steel. Hopper 41080 was also in the shops at

this time. The men in the shops were not familiar with the fact that different kinds of steel had been used in this car, but had replaced such parts that in their judgment required replacement. The Plain steel end sheet, floor sheet and outside hopper sheets had been replaced by new sheets. The Copper Bearing sheets in the same location were considered sufficiently good for further service and were not replaced. Another hopper was also inspected in one of the yards, which had been repaired some time previously. This car also had new end and floor sheets put in the Plain steel half, while the original Copper Bearing sheets were still in use.

A pronounced difference is noticeable in the cars, aside from the question of the paint previously noted. The Copper Bearing sheets are comparatively straight and free from serious bulges, dents, or bends. The Plain Open Hearth steel sheets are dented and bent out of shape to a much greater extent, indicating that they have become thinner in gage. In a number of the cars it is possible to determine which is the Plain and which is the Copper Bearing steel by this difference in appearance.

In addition to the differences noted, one gondola was inspected in which the Plain steel floor plates were worn and rusted completely through at several locations, while the Copper Bearing floor plates were still in good condition. One hopper was inspected in which the Plain steel side sheets had rusted through in two different locations. The Copper Bearing steel side sheets in this car were comparatively straight and gave no evidence of failure in the near future.

The plates and structural shapes used in the bodies of these cars amounted to about five tons in the gondolas and six tons in the hoppers. Since it is the body of the car that fails first, and ordinarily measures the life of the car, if Copper Bearing steel was used exclusively in the body, the average life would be increased from one-third to one-half, or in round numbers, from 5 to 8 years. This additional life more than justifies the slight extra per ton for the Copper Bearing steel.

Our experience and observation of these cars may be summarized as follows:

1. Paint adheres very much better to Copper Bearing steel in a car body than it does to Plain Open Hearth steel.

2. The saving in repainting cars, due to better adherence of paint to Copper Bearing steel, would be sufficient to justify

the use of Copper Bearing steel in the bodies of steel railroad freight cars.

3. Where mechanical abrasion has not been a serious factor as in the side sheets of gondolas, the loss in thickness for the Copper Bearing steel was only one-third as great as for the Plain Open Hearth steel.

4. Where the steel was subjected to severe mechanical abrasion as well as corrosion, the loss in thickness for the Copper Bearing steel was approximately 60% as great as for the Plain Open Hearth steel.

5. From the results of this investigation it can be conservatively stated that the use of all Copper Bearing steel in the body of the cars would increase the life of the car body from 33 1/3 to 50%.

CHAIRMAN: The speaker has very clearly and concisely shown the distinction between a certain percentage of copper in steel and plain steel. The subject is one of general interest, and it has been a problem with the railroad men as to just what they can do to prolong the life of the steel car. We hope to have a very general discussion. We will leave it at first to volunteers, if they will take the floor and make comments or ask questions of the speaker.

MR. A. STUCKI: The influence of copper in a general way has been known for some time and I myself have seen cars built of the two kinds of steel and had no trouble to determine at a glance which parts were made of plain steel and which had copper in them. However, the figures given by Dr. Unger are most astounding. They are most interesting to me and will no doubt convince the most conservative.

I now would like to know whether Dr. Unger has any figures as to the respective physical strength of the two steels.

MR. W. F. AMBROSE: I would like to ask if the speaker has any record of the use of these cars in steel mill trade such as blast furnace cinder, where a certain amount of quenching is done in the car. Also has he any record of the use of copper bearing steel galvanized.

CHAIRMAN: If you insist on your backwardness I shall have to call on a few names I have here. Mr. Edward B. Story, Metallurgist of the A. M. Byers Co., we would like to hear from you.

MR. EDWARD B. STORY: I am wondering if Dr. Unger can tell why copper bearing steel holds the paint better than the plain steel.

MR. G. T. VAN ARSDALE: What are the working qualities of the copper bearing steel under drilling and flanging?

CHAIRMAN: We have with us tonight Mr. Knox, Mechanical Engineer of the Bessemer & Lake Erie. We would like to hear from him.

MR. W. J. KNOX: I do not know that I have anything to say. But I have learned something.

MR. H. C. GIVLER: I would like to ask about the drilling of this copper bearing steel as compared with plain steel. What action has the drilling on the two materials?

MR. W. H. ALTSMAN: May I ask Dr. Unger where this series of cars was built?

CHAIRMAN: We have with us one of our past presidents who has given a great deal of study to the steel car. I believe he is a recognized authority on steel cars, and I will call on Mr. Samuel Lynn for a few remarks.

MR. SAMUEL LYNN: Some years ago I was inveigled into writing a paper on the carmen's troubles in trying to repair all-steel freight equipment. After considerable persuasion I prepared a paper and presented it before this club and among other items I made certain statements about the life of the steel which we were using for replacement in the cars requiring rebuilding and after I got through our good friend Dr. Unger, who is here tonight, got up and tore my paper all to pieces, laying particular emphasis on the fact that I was in error regarding the life of the steel. I notice, however, from his statement tonight regarding their experiments, that he must have got busy immediately after the meeting to which I refer, as he is here tonight telling us about the results of their experiments and the good results that are being obtained by the use of steel having a small percentage of copper in it. I did not come here prepared to go into the paper in the manner I should—Dr. Unger had the advantage in the discussion at the presentation

of my paper owing to the fact that at that time it was customary to send the papers out in advance of the meeting and this practice gave the members an opportunity to come prepared to discuss the subject fully, whereas, this practice of forwarding the papers to the members before the meeting has long since been discontinued, and for that reason I did not have any advance information regarding what the Doctor would say, before coming to the meeting. I will state, however, that the road with which I am connected has some three hundred hopper cars built some five years ago, which had a small percentage of copper in the steel. These cars have been inspected at stated periods, however, the inspection was just such as ordinarily made from observation, no special tests being made to develop the wear or deterioration of the plates. At the time these cars were built they were not constructed in the manner suggested by Dr. Unger by the use of two kinds of steel in the same car. I do not believe that there would be any great deal of difference in the usage of the cars, provided you take care of cars built in the same year and at about the same time. As an illustration—a hopper car is usually loaded with about the same commodities: coal, coke, iron ore, limestone or slag. We had two series of cars built about the same time; in one series copper steel is used and in the other series plain steel, and from a casual inspection I cannot say that we can detect very much, if any, difference as yet in the wear of the steel in either series of cars. It seems to me that the life of copper steel as compared with plain carbon steel will be shown when these cars reach the point where they will have to be cut down; at that time if the copper steel car shows that it has considerably more life left than the plain steel car before any or all of the floor and side sheets require renewal, we will then have some definite idea as to the increased life of cars built of copper steel and that we can obtain this result by a comparison of two series of cars built at the same time just as readily as we could do so by using both the copper and plain carbon steel on the same car.

In Dr. Unger's reference to the gondola car he stated, as I understood him, that the life of the gondola car was shorter than the life of the hopper car. Our experience is just the reverse of this statement—of the two types of cars the gondola car because of the service which the car is in and the fact that it carries a different kind of lading than that usually carried in the hopper car gives the gondola car a longer life.

In one of the slides Dr. Unger showed a gondola car on

which the side sheets were badly corroded, which he emphasized as due to the quick corrosion of the ordinary plain or carbon steel. In my experience I have seen pretty much the same condition as was shown in the picture and this condition developed within a week or two after the car had been turned out of the shops, at which time it had been repainted. The condition was brought about by hot lading being placed in the car which burnt the paint off the outside and left it more or less ragged around the edges where the paint was still on the car and I was just wondering as to whether this particular case was investigated closely to know that the condition shown was due to corrosion and not brought about by hot lading being placed in the car.

CHAIRMAN: Professor Endsley is here and we would like to have a few words from him.

PROFESSOR L. E. ENDSLEY: I am very glad to have been here tonight and to have heard Dr. Unger's paper. It has been a very fine presentation of a very interesting subject. I want to ask a question or two. Has it been determined in your mind and in your experiments that .25% is the limit to get the greatest life? I can see from the figures here tonight that you can pay 30% more for the steel and still make some saving. Is there a limit as to what it costs? How much more would the steel cost with the copper in it, or how much more would I have to pay for it if it carried a little more copper and would that little more copper give it a longer life? If 1% or 2% does not hurt it much—you know we all used to think that copper steel was weaker and I am glad some one asked how much weaker. I do not believe you could measure freight cars for the weakness, myself. If there is a limit as to what you can put in the steel commercially and if that limit has been arrived at from the commercial price that you could get for it or from the life of the steel, what is that limit?

CHAIRMAN: Are there any other questions? If not, we will give Dr. Unger a chance to answer the questions that have been asked.

DR. UNGER: In answer to Mr. Stucki's question as to what improvement one gets in the physical strength, or the tensile strength, by the addition of ¼% of copper to the steel, I can say that it is very little. It will not mean an average of

over 1000 lbs per square inch between the steel without copper and the steel with copper.

Mr. Ambrose asked if these cars I was describing had been used in hauling blast furnace cinder. Yes, to a very large extent, hauling the granulated cinder and hauling broken lump cinder to the slag dumps. Hot cinder is not ordinarily hauled in a car. If hot cinder gets into a car through improper quenching at blast furnaces—which might happen at times though it is rare—the railroad people are interested and the man who loads the car is also interested because he is immediately penalized for the injury to the car and he must pay for putting that car in good condition again and repainting it. It is to his interest to not load hot material.

Mr. Story asked why does the copper bearing steel hold the paint better. If you put your hand on the inside of the sheet that has not been painted, and it is plain open hearth steel, and try to slide your hand over it, it is quite rough, like sand paper. The rust is yellowish brown. It does not adhere closely. When you put your hand on the copper bearing sheet in the same location at the opposite end of the car, where there is no paint, you will find that it is very much smoother than the plate of plain steel. The rust is reddish brown and it does not rub off. The only reason I can assign for paint adhering better is the condition of the surface under the paint. Paint films are usually porous to a greater or less extent, and this gives an opportunity to corroding influences; consequently, the paint film is more quickly detached from the plate of plain steel than from the copper bearing steel.

Mr. Van Arsdale asked what is the working qualities of copper bearing steel under bending and flanging. As far as we can tell there is no difference, at least not enough to make any difference in the shops. None of the shops have complained in that respect at all.

Mr. Givler asked as to the drilling of the steel. A good bit of the work around the car is done by punching. There is some drilling. We can not see any difference and we never had any complaint. I do not know that there is any difference. A difference of only 1000 lbs. in tensile strength of the steel would be so slight you would not be able to tell whether the steel was any harder.

Mr. Altsman wished to know where the cars were built. Pressed Steel Car Co. McKees Rocks plant, as nearly as I can remember. It was fifteen years ago. I am not sure about that.

Mr. Lynn said he did not agree with my statement that the life of the gondola car is less than that of the hopper. I can only speak from my own findings. These were our conclusions based on our observations of approximately 100 gondolas and 100 hoppers.

He also suggested that probably hot loading in the car makes a difference in the appearance of the plate. These were not cars that were used inside the mills like our own cars. These cars were in service on the Beessemer and Lake Erie Railroad and used along with ordinary cars. It may be possible that in the 13½ years of service there may have been some hot material loaded into the car, but I think the chances are about even that the hot material would be in the copper bearing steel end of the car as well as in the plain steel end.

I want to call the attention of Mr. Lynn and of you all to this important fact. In making studies of these cars as far as we have gone, the copper in the steel is worth while. As nearly as we can estimate, taking the life of the car in use today, we think the copper bearing steel adds from five to eight years to the life of the car. But you know that you railroad men are making a freight car move more miles every day. You have been doing that for the last three years. The freight car moves a great deal farther in a year than it did five years ago. That means that it moves faster and has to be loaded and unloaded more times in a year and if you are going to measure car life by years you have to pay some attention to the service you give it. The natural conditions surrounding the car today, and in fact of almost every steel structure, are different from what they were in this district twenty-five years ago. The district has become largely industrial. We have developed our coal mines, and other industries. In developing our coal mines there is a certain amount of acid water that must go into the streams and if river water be used to quench a load for a car, such as ashes or granulated slag, that river water is not as pure as it was 25 years ago and it is a good deal purer today than it will be 25 years hence. The atmosphere is a reservoir for all the gases thrown out from the industries. As we become a more industrial community the atmosphere is not as pure as it used to be. Under these more severe conditions, the life of the car is not as long as formerly. By using copper bearing steel the life can be prolonged to equal that of the plain steel car of the past.

Mr. Endsley asked why we have just adopted .25% to .40%

copper content in the steel for the car, why if .25 is a good thing .40 is not better, and if that is good why not put in 1% or 2%. This is a very fair question. There is only one thing the matter with it. You can not put in 1% or 2%. Why? Because the iron will not take up or alloy with much over 1% of copper. You can make a small ingot with as much as 2% of copper, but it has to be made very small and chilled very quickly, otherwise the copper will immediately go down to the bottom

Getting back to the original question of .25 and .40% copper, if .25 is good .40 should be better. We did not know that 13 or 14 years ago. We were putting in .40 and it was not a bit better than .25. In fact after making experiments adding .02, .08, .10, .15, .25, up to .30 and .40, we found that the amount to be put into the steel should be above .10 copper and then it was just as good as it was at .25 and just about as good as it was at .40. Our ordinary specifications calls for .15 to .30 of copper or an average of .20 to .25.

I believe, gentlemen, that answers all the questions you asked me.

MR. LYNN: I had intended asking Dr. Unger another question—his general statement is that the life of the car with a percentage of copper in the steel is longer than the car with plain steel. Do you believe that a hopper car used in the coal trade constructed of copper steel, resists the effect of the sulphur in the coal to a greater extent than the plain steel?

In answering one of the statements I made, Dr. Unger made the statement that the increased use or speeding up of the car mileage had a lot to do with shortening its life. I am not so sure that I would subscribe to that statement—it is my opinion, and I believe there are other railroad men in this room who in their experience have found that cars standing idle on side tracks during business depression deteriorate much more rapidly than the all-steel car which is continually in service.

DR UNGER: Answering the last question as to the durability of the hopper in coal service the sulphur in coal is usually there in the form of pyrites. Corrosion is of many different kinds. This particular corrosion by sulphur in the coal is resisted very much better by copper steel than by plain steel.

CHAIRMAN: I see another of our past presidents who

has not been with us for some time, Mr. Stark, and we would like to hear from him.

MR. FRANK H. STARK: I am not in as good position as Mr. Lynn for he is still a railroad man. I appreciate being called upon, not being active any longer as a Railroad man. I can recall back 25 or 30 years, when somewhat younger than I am now, I commenced to attend meetings of the Railway Club, I was led to get up and make a motion tendering a vote of thanks to the speaker, until I became the authorized maker of such a motion. For the benefit of the younger members, it would not be a bad idea for you to do these little things, for eventually it leads to greater possibilities. In my own case I was later elected President of this Club for which I am truly grateful. I was also its Treasurer for many years.

I appreciate the remarks of Dr. Unger because he states facts in a plain, simple but forceful manner that any barn yard philosopher like myself can understand. He has put it in a way that we ordinary car fellows can grasp what he is driving at. I notice he is pretty clever at sidestepping also. Somewhat like the old lady who was asked how old she had to be before she gave up any thought of wanting any association with men. She said, "You will have to ask somebody older than I am." The Doctor was asked the last time he presented the same subject as to what is going to be the difference in cost. He said, "Consult the Car Builder." Tonight he sidestepped altogether.

I noticed in the pictures he refers to some pure iron that looked very good in the picture. He referred to it, but he did not emphasize it any. And I take it that it was because wrought iron costs so much more that it would not be practicable to use it in car construction. However we used to build smokestacks for the Pittsburgh Coal Co. mine plants and they had to be renewed frequently. So we commenced to build them in pairs and we used so-called pure iron for one stack and open hearth steel for the other, and the wrought iron won out.

Speaking of the life of steel in gondolas as compared with hoppers, I shall have to agree with Brother Lynn. I know that the Montour Railroad got some gondola cars built in 1905, which makes them about 23 years old, and they are still in service and can be inspected on the Montour Railroad, and I would say that the majority of the original floor and side sheets are still in the cars. The ends of course had to be renewed on ac-

count of damage. They also have another series of gondola cars that the bodies were built on 40 ton old trucks taken from dismantled wooden cars. We undertook to design the body in a manner that we anticipated would give twelve years of service. We had the floor sheets 5/16″ instead of ¼″. We increased the end sheets and very largely increased the floor sheets, particularly the end floor sheets. In going through the yard the other day I observed those cars. It looks as if they would be like the old one horse shay, and all parts give about equal service.

In both cases the steel was made from Pennsylvania Railroad specifications and I think that has a great deal to do with the life of a steel car. I believe where steel is taken without any regard for formula they rust out sooner than where it is made according to good specifications.

While I have not been railroading for some time I am still interested in railroad subjects and I must say that Dr. Unger is very bold to come here and advocate something that will add 50% to the life of the car at a possible increase of 10% in cost, because I wonder how they will market their tonnage if they make cars last so long. However it is commendable, I think, that the manufacturer is anxious to produce a better quality of material and thus reduce cost.

In view of the importance of the subject I would have that we extend a vote of thanks to Dr. Unger for this very instructive paper and hope that he will come back at a later date and give us another one of his instructive talks.

The motion was duly seconded and prevailed by unanimous vote.

CHAIRMAN: Dr. Unger, you have the sincere thanks of the Club.

DR. UNGER: I thank, you, gentlemen. Answering the question as to cost, the cost of the copper steel does not amount to very much. It is about $3.00 a ton extra. There are about 6 tons in the body of a gondola, six times $3.00 is $18.00. I can not see that there is much difference in the cost of the car.

CHAIRMAN: We have called on a couple of our past presidents. We have with us some of the younger officers who will no doubt succeed to the presidency in time. I see Mr.

McAbee, Second Vice President in the back of the room and I will call on him for a word.

MR. W. S. McABEE: I am not going to give you any discussion of Dr. Unger's paper. I find it does not pay. But in support of his contention here I will say that we have on the Union Railroad at the present time approximately 2500 cars that are fully equipped with copper bearing steel bodies. That has been going on now for four years. That is our policy. Of course it is based a good bit on Dr. Unger's observation and tests on the Bessemer & Lake Erie Railroad.

CHAIRMAN: If there is no further discussion we will entertain a motion to adjourn.

Upon motion duly seconded meeting adjourned and luncheon served as usual.

J. D. CONWAY, Secretary.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of Official Proceedings—Railway Club of Pittsburgh, published Monthly, except June, July and August, at Pittsburgh, Pa., for April 1, 1928.

STATE OF PENNSYLVANIA }
COUNTY OF ALLEGHENY } ss:

Before me, a Notary Public in and for the State and county aforesaid, personally appeared J. D. Conway, Secretary, who having been duly sworn according to law, deposes and says that he is the Editor and Publisher, of the Official Proceedings—Railway Club of Pittsburgh.

Publisher Official Proceedings—Railway Club of Pittsburgh.

Editor, J. D. Conway, 515 Grandview Avenue, Pittsburgh, Pa., (19th Ward.)

Managing Editor, J. D. Conway, 515 Grandview Avenue, Pittsburgh, Pa., (19th Ward.)

Business Manager, J. D. Conway, 515 Grandview Avenue, Pittsburgh, Pa., (19th Ward.)

President, E. J. Devans, Du Bois, Pa.

Vice President, F. W. Hankins, Philadelphia, Pa.

Secretary, J. D. Conway, Pittsburgh, Pa.

Treasurer, E. J. Searles, Pittsburgh, Pa.

Known Bondholders—None.

J. D. CONWAY.

Sworn to and subscribed before me this 21st day of March, 1928.

(Seal) SUE B. FRITZ, Notary Public.

(My commission expires February 21st, 1931.)

OFFICIAL PROCEEDINGS

RAILWAY CLUB OF PITTSBURGH

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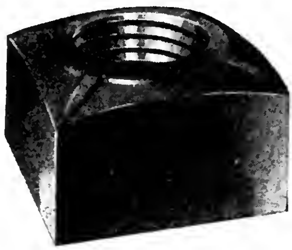
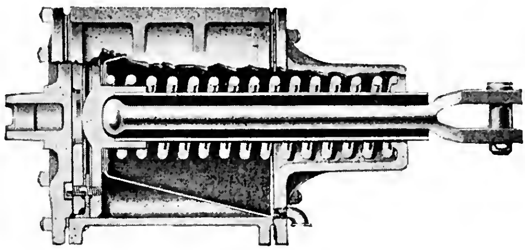
Vol. XXVII MAY 24, 1928 No. 7

SUPERVISION OF YARD OPERATION

By H. R. FERTIG, Chief of Yard and Terminal Operations,
The Chicago, Rock Island & Pacific Railway Company, Chicago, Ill.





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No. 7.

Pittsburgh, Pa., May 24, 1928.

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Meetings held fourth Thursday of each month except June, July and August.

PROCEEDINGS OF MEETING

May 24, 1928

The meeting was called to order at the Fort Pitt Hotel at 7:00 o'clock P. M., (Eastern Standard Time) by the Secretary, who announced that he had received word from President Devans that he had been unexpectedly called away on Company assignment. In the absence of the Vice-Presidents, Mr. A. Stucki, ex-president, was called to the chair.

The following gentlemen registered:

MEMBERS

Adams, W. A.
Altsman, W. H.
Berg, K.
Bowen, James T.
Campbell, J. E.
Campbell, J. T.
Cannon, T. E.
Champion, James H.
Cipro, Thomas
Conway, J. D.
Cunningham, W. P.
Dambach, C. O.
Davis, Charles S.
DeLaney, V. W.
Eagan, J. T.
Emery, C. W.
Emery, E.
En Dean, J. F.
Endsley, Prof. Louis E.
Falkner, A. J.
Fendner, W. J.
Fisher, Harry G.
Forney, Michael F.
Frauenheim, A. M.
Fults, J. H.
Geisler, J. J.
Goda, P. H.
Grieve, Robert E.
Haller, Jacob
Haller, Nelson M.
Hansen, William C.
Harris, Francis C.
Hastings, W. S.
Hoover, J. W.
Horner, William
Hughes, J. E.
Kellenberger, K. E.
Kelly, L. J.
Ketchpel, Paul A.
Kroske, J. F.
Lanahan, J. S.
Laurent, G. F.
Lawson, R. R.
Leckey, Ralph F.
Lewis, Walter M.
Lobez, P. L.
Meehan, C. L.
Miller, John
Mitchell, W. S.
Morgan, A. L.
Moyer, Oscar G. A.
McIntyre, R. C.
McHugh, C. A.
McKinzie, E.
McManus, Charles J.
Ness, H. S.
Orchard, Charles
Painter, Joseph
Passmore, H. E.
Rauschart, E. A.
Richardson, H. A.
Ryan, D. W.
Sayre, F. N.
Schaacke, William
Schmidt, E. M.
Schultz, H. P.
Seiss, W. C.
Sharp, H. W.
Shellenbarger, H. M.
Shelton, F. M.

Simons, P.	Vandivort, R. E.
Stoehr, Arthur L.	Van Vranken, S. E.
Stoffregen, L. E.	Van Wormer, G. M.
Stucki, A.	Wilkinson, F. C.
Sutherland, Lloyd	Wolford, Jesse J.
Trance, F.	Wood, E. H.
Tucker, J. L.	Woodward, R.

VISITORS

Bead, McPherson	Montgomery, William J.
Buson, H. S.	Mullen, Thomas
Cannon, A. W.	Perry, G. M.
Davis, William B.	Pugh, A. J.
Dunham, C. W.	Ritterbush, L. C.
Hoerner, A. S.	Rutter, Homer
Kirsch, O. W.	Schmitt, G. A.
Kusick, Harry F.	Smith, Sion B.
Ledwith, A. B., Jr.	Statler, J. M.
Lewis, S. B.	Stewart, James
Lent, John F.	Wood, W. A.

The call of the roll was dispensed with, the record of attendance being obtained through the registration cards.

The reading of the minutes of the last meeting was dispensed with as they have appeared in printed form and been distributed to the members.

The Secretary read the following list of applications for membership:

Donaldson, Warren A., Clerk, B. & L. E. R. R., 3235 Gaylord Avenue, South Hills Branch, Pittsburgh, Pa. Recommended by William P. Conner.

Montgomery, William J., Railway Representative, The Sherwin-Williams Company, Cleveland, Ohio. Recommended by W. H. Altsman.

CHAIRMAN: These applications will be referred to the Executive Committee, in accordance with our By-Laws, and upon approval by them, the gentlemen will become members without further action.

CHAIRMAN: We now come to the paper of the evening. We are very fortunate to have with us a man who is well versed on the subject, "Supervision of Yard Operation." I think this is the first time he has appeared before us, therefore, we are doubly glad to welcome Mr. H. R. Fertig, Chief of

Yard and Terminal Operation, Chicago, Rock Island & Pacific Railway Company, Chicago, Ill., who will now address you.

SUPERVISION OF YARD OPERATION

By H. R. FERTIG, Chief of Yard and Terminal Operations, The Chicago, Rock Island & Pacific Railway Company, Chicago, Ill.

"Behold, there went out a sower to sow:

And it came to pass, as he sowed, some fell by the way-side, and the fowls of the air came and devoured it up.

And some fell on stony ground, where it had not much earth; and immediately it sprang up, because it had no depth of earth:

But when the sun was up, it was scorched; and because it had no root, it withered away.

And some fell among thorns, and the thorns grew up, and choked it, and it yielded no fruit.

And other fell on good ground, and did yield fruit that sprung up and increased; and brought forth, some thirty, and some sixty, and some a hundred."

Whether we realize the fact or ignore it, we are all sowers of some kind of seed; every act, every spoken word finds the same different soils so fittingly illustrated in the parable of the Sower. The sower is not responsible for the unfruitful soil upon which his seed falls; he is not responsible for the small return from his labor, but he is responsible for the kind of seed he sows and how he performs the task of sowing and he is entitled to the satisfaction of the return from his sowing on the fruitful ground, and he should take consolation in these two facts—that he has sown intelligently good seed, and that he has had return from such seed that has fallen on fruitful ground.

The urge of the age, as of past ages, is to do better and more quickly all that is undertaken. Hindering limitations are no longer accepted complacently and unprotestingly. Space separates the peoples of the earth in distance, but no longer greatly in time. The spoken word encircles the globe in the twinkling of an eye, bringing its answer simultaneously. Gradually other and more stubborn limitations are being overcome. The covered wagon, the pony express, the lumbering stage coach, the river steamer have all had their successive days and generations. The steam locomotive and its train of palace cars succeeded them and long promised to resist any effort to dis-

place or supersede it. Already its permanency as an indispensable agency is seriously threatened by the air and rail merger. As those of every past era probably have observed, so we of this, are inclined to say now, the last word in transportation has been spoken. The inventor of the wheeled stoneboat probably was as wise in this respect as we of today.

No one realizes better than I that the honor you have conferred on me in the opportunity to appear before this, one of the largest Railway Clubs of our country, has not been extended me with the thought that I could show you how you should operate your yards and terminals, but rather it was an expression of desire to learn how another railroad did those things which go to make successful operation, and with the thought, no doubt, that there might be fruitful seed which, when sown in the fallow ground of your different organizations, would increase the yield from transportation effort.

With this thought in mind, it will not be my intention to assume the position of telling you how to do your work better, but rather tell you how we did our work better, hoping that such seed as I may sow will fall on good ground and in the end help you to do your work better, if you can find anything in what I say that will help you in so doing.

The operation of yards and terminals has, during the past few years, taken its rightful place among the different units of transportation, and today yard operation is receiving more of the attention of the executive and general officers of our railroads than ever before in the history of transportation. We must realize that the forces at initial terminal, the intermediate yards and the final terminal, hold the destiny of transportation in their hands. Unless traffic is properly dispatched without delay from initial terminal and so classified that the traffic will be insured uninterrupted movement through to destination, fast train schedules and on-time performance will not serve the shipper or consignee of that traffic delayed at point of origin.

Unless traffic is handled promptly through the intermediate terminals en route to destination, the work that has been done at the initial terminal is wasted; and if, on arrival at destination yards traffic does not receive prompt handling from the yard to the point of final delivery, all of the efficiency of the carrier has been set aside and there is a dissatisfied patron.

Never were the different carriers working so closely together in the interchange of traffic as at the present time. Traffic is no longer handled over a railroad with the view of

getting it to the ends of that carrier's rails; it is just as important today that such traffic be handled so that there will be a minimum of terminal detention at junction points as it is to handle traffic promptly which will be delivered on the carrier's railroad. Train schedules are continually being changed to fit the schedules of other lines, and yard operations are being adjusted to insure such connections with outbound schedules as to provide, in a large measure, unified schedules. The day is long past when traffic can be handled in yards with a view of strict economy; the old practice of confining deliveries to connecting lines to one and two transfer trains daily has been abolished forever, and rightly so; traffic is being handled through yards and terminals today at a speed which would not have been thought possible a few years ago; special transfers are being run from and to all the different railroads at our large terminals with one and two cars, solely that the traffic may make the very best movement through to destination. The public is getting more and better service day by day through a better terminal operation, something of which they have little knowledge. Most of those here who represent the revenue producing public of the carriers are more or less familiar with the freight schedules between Pittsburgh and Chicago or St. Louis, and between those centers and points in the west, but they have no way of knowing that the work performed in the yards of the carriers who are intrusted with their commodities must function at a high degree of efficiency continuously, or those schedules so highly advertised would be of little real benefit.

These changed conditions in the handling of transportation has made it necessary for new seed to be sown by the carriers in order that the changed conditions could be successfully met. On the Rock Island in 1923 we found ourselves confronted with a terminal problem which could be met in but two ways—either by increasing the capacity of a number of our yards which we were not in a position to do either financially or from a time standpoint, or by eliminating congestion by classification of through traffic. Our traffic was increasing to the capacity of our facilities, our competitors were providing schedules with which we must compete if we held our business and expected more of it. This problem was largely solved by the systematic classification of traffic at originating terminals and the establishing of maintracker trains which could be operated over an extended mileage without trains being switched at terminals. It is probably hard for some of you with the railroads centering

in the Pittsburgh district, to realize the diversified nature of the traffic of the western carriers, very few of which have the opportunity for dispatching solid trains of one or two commodities. Most of our traffic originates in small lots from a great many originating centers or from connecting lines, and the classification of such traffic is much more of a problem on the western lines than on the larger eastern railroads.

Before we revised our classification as it is now handled, I had the privilege of spending considerable time on the Baltimore and Ohio Railroad making a study of their system of classification, which, with some changes to meet our requirements, was used on our line. I will not take your time in going into this feature as you are, no doubt, all conversant with the B. & O. plan, or have a system which is satisfactory to your needs. Sufficient to say that the classification of traffic relieved the burden in our terminals—not only permitting us to make very substantial reductions in our schedules, but has enabled us to handle through these same yards an increase of 19.0 per cent in our traffic since 1923. Not only are our schedules comparable, or better than our competitors, but our trains are operated more on schedule, and our traffic is receiving a better and more expeditious handling at and through our yards and junctions.

Like all other new activities, all of the seed did not fall on good ground, some fell among thorns, but the thorns could not kill it; some of it fell on stony ground where we have to continually sow new seed; a great deal of it fell on good ground and has returned thirty, some sixty, and some a hundred fold.

One of the first things we found when we got into the problem of classification was the fact that there would not only be an opportunity for speeding up the movement of traffic, but that through a systematic supervision of terminal expenses a more economical operation could be brought about—not by relieving the division officers of their responsibility for economy, but by providing a means whereby the local yard forces and the division officers would have a better working knowledge of their daily operation in each yard or terminal.

Probably in no other activity is there such an opportunity for wasting time as in yard operation. Men on the road are under the control of the dispatcher and a ready check is available of their performance. Men in the shops are under the eye of their supervisory officers more or less constantly; but, in a yard, particularly a large one, the situation is somewhat differ-

ent. There is so much to do off in the far corners away from the supervisory eye, and so many ways in which it can be done improperly so as to result in time leakage, that it behooves the yard supervisory force to be unusually attentive. Even this is not sufficient—the yard supervisor must not be content merely with seeing that the work is done as promptly as possible according to the methods in vogue, but he must study constantly to improve his methods. General supervision of all yards of a system when delegated to one experienced man, has proven helpful in aiding the local men in ironing out their individual problems as well as those common to all yards.

It has always been considered that a good yardmaster was not much of a bookkeeper, that he did not have time to spend looking into the cost of operation if he covered the ground usually covered by a yardmaster. It was not with the intention of making bookkeepers of our yardmasters that our reports were required of them, but through this bookkeeping to make of them better yardmasters. That this has been done cannot be questioned and there are few, if any, on our railroad who would want to go back to the methods effective prior to March, 1924. A recent survey made to get an expression on the monthly reports made in our office failed to disclose a single recommendation that they be discontinued.

The constant contact between the yardmaster and his expenses developed in him a natural desire for economy; not only did he watch his overtime and his extra jobs closely, but he got new interest in the fuel charged to his transportation yard switching—in the re-lightweighing of equipment and the extended hours of yard locomotives, all of which have had special attention since the organization was created to supervise yard operation.

No man who is really interested in his work wants to be relieved of his responsibilities, and it is a mistaken idea that the responsibility for any transportation activity should be taken away from the man who has the direct performance in charge. Only by carrying responsibilities can a man develop into greater worth, and if through bringing out new desires and new activities a plan can be carried on successfully, it can but result in good not only to the railroad as a whole, but to the individual which is of the utmost importance—the development of latent energy.

In the last analysis, it is not those who plan, but those who make the plan a success who really deserve credit; the

success of any railroad does not depend so much on those sitting in authority, but rather on the caliber of the men in the field upon whose shoulders rest the successful operation of the property. With no desire to reflect discredit on men in the same positions on other railroads, I have always felt that the success of our terminal supervision has been the result of the whole hearted support and co-operation of the yard masters, the clerks, the enginemen and switchmen, and the mechanical department employes—to say nothing of the district and division officers. We have planned, they have tilled the soil and brought the seed into fruitage.

In order that those who are interested in the system of reports we use on the Rock Island may study the forms, I have prepared a number of exhibits in which are included those forms used by us. I will only take time now to explain briefly the different forms and their use:

Freight Terminal Performance

This is the daily operating sheet of each yard where yard engines are operated, and shows all of the transportation yard engine expense, clerical, switch-signal tenders, enginemen and trainmen and yard masters, with the cars handled, fuel consumed, cars light weighed and restenciled, and all of the detail necessary for close supervision of the yard operation. From this record can be determined daily, not only the expense for that date, but the accumulative expense since the first of the month.

Form C. T. 53

This form is the tabulation compiled daily in our office from each of the daily C. T. 52-A reports received from the yards, and shows the information required to compile our monthly report covering yard operations. At the end of each week the totals for each yard are carried forward to another tabulation covering the expense for each week. We can make a comparison at the end of each week with the same period in any month this year, last year, and for four years. At the end of the month we have but the four weeks totals to add to secure the month's record, which is then compiled into the YTO-1 Report which covers each yard, consolidated into division, district and total for the system. A sheet from our YTO-1 Report is contained in the exhibit.

Form C. T. 26

This record is kept by each engine foreman and gives a

ROCK ISLAND LINES

FREIGHT TERMINAL PERFORMANCE FROM .... Yard

24 Hours Ending 11:59 P. M. .... 192...... and Total to Date This Month

Actual Time Worked by Yard Engines and Wages	ENGINE HOURS	WAGES TODAY	TOTAL TO DATE HOURS	TOTAL TO DATE WAGES
Total Yard Engine Hours (Straight Time)				
Total Yard Engine Hours (Overtime)				
TOTAL YARD ENGINE HOURS (Straight and Overtime)				
Departmental Switching (Straight Time Rates)				
TRANSPORTATION HOURS (Freight—Passenger)				
Switch Tenders ; Pilots				
Yard Masters Regular and Relief				
Clerical Forces (Charged to Yards)				
TOTAL TRANSPORTATION HOURS AND WAGES				

NUMBER ENGINES	
Assigned	
Available	
Used Today	
Jobs Today	
FUEL CONSUMED	
Today	
To Date	
RESTENCILLED TODAY	
System	
Foreign	
TO DATE	
System	
Foreign	
TOTAL CARS	

FREIGHT AND PASSENGER CARS HANDLED

	HANDLED TODAY TRAINS	HANDLED TODAY CARS
Inbound Freight		
Outbound Freight		
Inbound Passenger		
Outbound Passenger		
From Connections		
To Connections		

TOTAL CARS HANDLED TODAY	
TOTAL CARS HANDLED TO DATE	

ENGINE HOURS LOST TODAY

Engine Late on Job *	
Engine Failures on Job *	
Derailments in Yard *	
Help Trains In or Out *	
Other Delays *	

DEPARTMENTAL AND PASSENGER

ACTUAL TIME CONSUMED	TODAY HOURS	HOURS TO DATE
Mechanical and Car Department		
Store Department		
Maintenance of Way Department		
Tie and Timber Department		
TOTAL TIME DEPARTMENTAL SW		

UNIT COST	TODAY	TO DATE
Cars per Transportation Hour		
Transportation Wages per Car	¢	¢
Passenger Switching Hours		

*Explain Overtime and conditions interfering with efficient yard operation.

Correct. ....

Agent or Yard Master

complete history of his movements over the terminal during the hours worked by his crew. This is checked by the yard master or his representatives for delays, overtime, or other adverse conditions and gives the basis for the engine expense at the yard each day.

Form C. T. 52—Terminal Dispatchment Record

This is one of the most important records kept by our yard offices; at first I thought it would work a hardship on some of the yards to compile this record, but it is of so much value to the yards that they would not want to do away with it. It is the train sheet of all trains arriving in and departing from the yards, and gives a history for all time of the operations during the day covered by report. This record places the responsibility for train delays where it belongs. If the Dispatcher instructs a train be called for a connection to arrive at a certain time and the train does not arrive until an hour later than his call figure, there is no passing the buck as to why the outbound crew was called—it shows right on the report. If a train is set back for an engine there is no passing the buck in a week or ten days when the delay is questioned—it shows right on the report when the enginehouse OK'd the engine. If the train is delayed account made up late it shows on the report. If the engine is not on the train in time to leave on-time, the report so shows, and also the time consumed in testing the air and the cause of delays to all outbound trains. This report has done more to eliminate terminal delays to outbound trains than any one thing on our railroad. The Train Master as well as the General Superintendent gets a copy of this report daily, also our office, and same is checked and irregularities handled at once and not a week or ten days later, or probably never. This record has served a wonderful purpose in connections with claims, especially live stock and perishable freight claims. From this record can be checked the detention to power at any terminal, something which has to be watched closely, especially during heavy seasonable business such as we have two or three times each year.

There are so many uses we make of this record that I cannot take time to go over all of them, but will mention just two of the special items we have recently handled. The Engineering Department contemplated a new line into Kansas City; they wanted to know how many trains were operated into and out of Kansas City, the tonnage handled, the class of power and

the number of loaded and empty cars handled. It was possible for us to compile this data in a short time from the Terminal Dispatchment Record of Kansas City and Trenton, Missouri, so that they had a year's record. How long it would have taken to do this from the train sheets cannot be guessed.

The Engineer, Assistant to Vice President and myself have had in mind for some time the strengthening of bridges over a part of our line to permit running Mikado power through two terminals and eliminating train miles. It was a small job to determine the average detention to power at these intermediate yards from the Terminal Dispatchment Record, and to have a positive knowledge of the saving which could be made by running power through.

Form M. P. 71—Car Inspector's Record

This form is filled out by the Car Inspector covering each inbound and outbound train, and gives to the yard master the initials and numbers of all bad order cars in trains, which enables the yard to get any important loads that may be bad order to the repair tracks and get them repaired with the least possible delay. We have many cases where cars have been repaired while the train was in the terminal and the car moved in connection without delay. We have always had trouble placing the responsibility for outbound train delays. It is a standard excuse of the yard forces that trains are delayed "for engine and testing air." We have stopped this by having the Car Inspector show the time engine was on train, time air and inspection was finished, and time train left yard, also time the train was made up. If there is any question about it it is up to the wardmaster to settle it with the inspectors as he has to show this information on his Terminal Dispatchment Record. The Mechanical Department thought so well of this form that they made a slight revision in it and cut out one of their forms which the inspector had to make out. As in the case of other forms we put in, we tried to take something away for the added work our reports called for, so that in the end we did not add any work, but made the work mean more.

Form C. T. 54—Light Tonnage Report

From the Terminal Dispatchment Record we compiled the report of Trains Dispatched in Direction of Heavy Traffic, showing all trains which left each terminal with less than their established tonnage rating. This record was used by the Gen-

eral Manager and Superintendent to check the utilization of road power.

Form C. T. 52-B

This report was established for use at the larger terminals where special records were made to different traffic representatives, and to Superintendent Transportation covering symbol freight. It enabled the yard to compile their reports for several different offices at one operation and reduced the clerical effort very materially.

Supplementary C. T. 52-A Report

This is not a printed form but is made in our office and copies furnished all the larger yards to show the utilization of their yard power. At the smaller yards we do not require this form, but they show the information on the back of the C. T. 52-A Report each day. This record enables us to tabulate in our office the utilization at any or all of the yards if we desire. We have an improvised form which we use for this purpose, a copy of which is included in the exhibit.

By this time you have, no doubt, come to the conclusion that our yardmasters must be bookkeepers, but you would be surprised if you could just talk to a few of them and see how interested they are in their records. I recently had letters from thirty-five of the yardmasters at our larger terminals, and not in a single letter was there a word about too many records, but there were numerous expressions of appreciation of the methods we have used to bring yard operations up to a standard of which all of us are proud. One of our hard boiled yardmasters had a favorite expression that "a yardmaster is just a high priced messenger boy." Bill talked this so much that it got on my nerves, but it was only a few months after we put in our classification system that he got another slant at the game and became one of our most ardent supporters. He is now President of the Rock Island Yardmasters' Association, and he has not said anything about a yardmaster being a "messenger boy" for three years." Now he likes to refer to the days "when we switched cars with an ox team," referring to the manner of handling traffic before the classification. Bill is just an example of the changed attitude of men who are given recognition and placed on a parity with other officers of the company; all they need is encouragement—no one can tell them how to do their work, they KNOW. What is needed is to let others know that they know and encourage them to do more of the same kind

of work. That has been our mission and all honor is due them for their response.

Now just a little about the results; that is what we all want—results. My hobby has always been—foreign cars and the re-light weighing of equipment. When I was a Car Distributor down in Arkansas I was very much discouraged by seeing the number of Rock Island cars coming back from New Orleans with the Illinois Central re-light weigh marks on them, and I made up my mind that if I ever got to a place where I could stop that expense I would do my best to stop it.

We began sowing the seed of re-light weighing immediately on starting our terminal supervision. We sowed on some very stony ground in some places, but we kept on sowing, being thankful for that seed which fell on good ground, until now there is hardly a yard on the system where there is a track scale that is not doing their share to perform this service.

In our exhibit you will find the following tabulation showing the re-light weighing of foreign equipment:

1923	4,391 cars
1924	5,389 cars
1925	6,541 cars
1926	9,139 cars
1927	12,675 cars

In 1927 we re-light weighed 8,284 foreign cars more than in 1923; 7,286 more than in 1924; 6,134 more than in 1925; and 3,536 more than in 1926. In 1927 the Rock Island re-light weighed more foreign equipment than any railroad in the United States and Canada. There were two other lines which showed more cars than the Rock Island, but those two lines took credit for cars owned by their subsidiary lines which, in reality, were not foreign cars to the parent lines.

This record can be entirely attributed to co-operation between the Transportation and Mechanical departments and to the competitive comparisons we put out from time to time showing just what each yard is doing. As an example of the effect this has on local pride I will cite the record at Chicago Terminal: In April, 1927, the Chicago Terminal re-light weighed 302 system and 8 foreign cars, or a total of 310 cars; in April, 1928, they re-light weighed 1,234 system and 469 foreign cars, a total of 1,703 cars. From a very poor record in April, 1927, this terminal in April, 1928, re-light weighed over fifty per cent of all the cars re-light weighed on the entire First

District, and over thirty per cent of all the foreign cars re-light weighed on the entire system for April, 1928.

Generally speaking, the Yard Master does not care much about a yard engine other than to know that it is large enough to handle the cars he ties on to it; what makes the wheels go around does not interest him so much as their going around when he wants them to turn; he does not worry so much about how much coal goes into the firebox, just so there is plenty of steam to pull or push his cars. Every time he sees her popping off he feels happy for it shows a full head of steam. The only time he worries about steam is when she is raising her water and throws mud on his white collar or his new straw hat. That might describe some yardmasters, but it does not apply to the Rock Island yardmasters as a whole.

Our yardmasters soon found that they were being charged with the coal that the yard engines were burning—of course, they always knew some one was paying for it, but not being bookkeepers they did not have any knowledge of how the Auditor distributes the expenses. We got our yardmasters to thinking as hard about coal as they did about overtime; some of them got so interested they rode on the engines, looked into the firebox and talked fuel conservation to the fireman and engineer. Some of them learned a lot just as I have learned a lot—by asking fool questions and being interested in the other fellow's job. This is concentration; this sowing of seed could but take root in that good ground on which it fell. The fuel performance is just as vital to the yardmaster as it is to the Superintendent, and our yardmasters soon began to see results from their efforts.

Was there a return from this sowing? Here it is:

In 1927 the Rock Island worked 59,075 more yard engine hours than were worked in 1926; in 1927 the Rock Island burned 56,628 tons of coal less than in 1926 by reducing the pounds of coal per engine mile from 153.3 pounds in 1926 to 142.1 pounds in 1927. If you do not care for this as a fair figure, the actual decrease in tons consumed in 1927 was 11,959 actual tons with an increase of 59,075 hours worked.

Our campaign on the extended use of yard power has met with the usual support and success. This campaign has developed several new angles of yard supervision which have been taken advantage of.

The three outstanding effects developed through the extensive utilization of yard locomotives are: reduction in fuel

consumption through the elimination of fire knocking and boiler washing; reduction of running repair expense through keeping the engines in productive service rather than in engine-houses; and reduction of congestions at ash pits, turntables and in engine-houses, permitting more economic and expeditious handling of road power. Clearly, the fewer times engines pass over ash pits the less fuel will be dumped into the ash pit; the fewer times the engines are washed out, consistent with good performance, the fewer times fires will have to be knocked and rebuilt. One of the best General Superintendents of Motive Power our railroad ever had, said at one time that every time an engine went across a turntable into an engine-house it cost the railroad ten dollars. One of the best Superintendents of General Shops told me that in his opinion, based on thirty years' experience, ninety per cent of the running repairs reported by engineers could be fixed with a cold chisel and a hammer—if it were done at the right time. Both of these statements are, no doubt, largely true and have been demonstrated as true in our campaigns on utilization of yard power.

You know, we are all creatures of habit; we get in the habit of doing things one way and it is hard to get out of the habit. Some of our methods were all right years ago, but we just can't get out of the habit of doing things like we used to do them. At one of our largest terminals we had a standard practice of washing boilers every five days, and we had done this so long it was a habit. We put five of our large lead engines on twenty-four hour continuous service in October and worked these five engines through the month (except one which was damaged in derailment on October 23d); they had five washouts in August and one in October and the enginehouse foreman told me they were no dirtier at last of October than they had been in five days in August. The difference was that in October the engineers took care of the boilers while on the job; they knew they would get the same engine the next day so they blew out the boiler once or twice on each job and kept the mud out of the boiler, and by each engineer taking such interest in his engine the engines worked through the month without a washout. On the other side of the cab, the fireman knew he would get the same engine the next day; he knew if he did not leave the fire in good condition for Bill and Bill for John, when he got the engine from John the fire would be up to the door and he would get a black eye if he had to take the engine to the ashpit to have the fire knocked and rebuilt. So it

worked through October and is still working at that yard and at many other yards on our railroad. We had to sow the seed in good ground—we picked our ground in this instance and it bore fruit at once. We did not have such good ground at first at one other large terminal—it took several months to get the seed sprouted, but when it did sprout it grew with wonderful rapidity, so much so that this terminal made the best record of the system with their power in April this year.

The seed for this campaign was originally sown in our Chicago Terminal, where in August we worked two of our reconstructed road engines for twenty-five consecutive days without taking the engines off the job, and without dumping the grates a single time; the only attention given the fire being that careful firing of the firemen and the dumping of the ashes from the pan during lunch periods, at which time the grates were rocked slightly to deposit ashes in the pan. From this test we went into the systematic utilization of our power.

Was here any return from this seed? Here it is:

For the seven months prior to September 1, 1927, the engine-house expenses chargeable to Ashpit Employees, Engine Cleaning, Boiler Washing and Watching and Dispatching, amounted to $201,523.00. During the seven months subsequent to September 1, 1927, these same items were $173,408.00 or $28,-125.00, 13.9 per cent less than the seven previous months. The total engine-house expenses chargeable to yard operation decreased $54,031.00 or 10.1 per cent. No one can definitely say how much of these reductions were directly creditable to the extended utilization of yard locomotives, but we can say that this had no small part in these reductions.

Did it save any coal? This we affirm it did do. Not only at the large terminals where this can better be carried out with lead engines, but on road divisions; at Kansas City terminal the pounds of coal per engine mile during six months prior to September 1, 1927, was 119.6 pounds; during the six months subsequent, which includes three winter months, this was reduced to 110.1 pounds per mile, a reduction of 9.5 pounds during months when one would naturally look for an increased fuel consumption account cold weather.

This plan can be carried out at any yard where there are jobs matching up as to hours of starting work. This is shown by the record of one of our road divisions on which there are no large yards. In the exhibit you will find a record of utilization for month of April, 1928, and which shows the division in

question; our El Paso-Amarillo Division made the best record of any division on the system, twenty hours and five minutes per day with every yard engine used during the month. On this division the fuel consumption per yard engine mile was 124.2 pounds per mile March to August, 1927, and from September, 1927, to February, 1928, inclusive, it was 96.5 pounds per mile, a reduction during the winter months of 27.7 pounds per engine mile. This shows what can be done when the entire division is interested in any special effort.

In the exhibit you will find the record of the performance of nine engines used at two of our larger terminals in December, 1927, compared with December, 1926, the average utilization during the month of December, 1927, being twenty-two hours and twenty minutes for each day of the month compared with fourteen hours and fifty-five minutes per engine per day in December, 1926.

The record of the El Paso-Amarillo Division shows that in April, 1926, the average utilization was ten hours and thirty minutes per engine per day; in April, 1928, it was twenty hours and five minutes per day.

On the St. Louis-Kansas City Division, of which Kansas City Terminal is a part, there was an increase in yard engine miles of 5.5 per cent from September to March this year, with a decrease of 13.2 per cent in tons of coal consumed. On the El Paso-Amarillo Division there was a decrease of 9.4 per cent in miles with a decrease of 29.6 per cent in fuel consumption compared with the previous six months.

In the exhibit you will find a record of a reconstructed road engine at Amarillo, Texas yard for January. This is one of the old "Mother Hubbard" type engines, one of those where the cab was over the middle of the boiler with the fireman away out behind—roasting on the boiler side and freezing on the side next to the coal tender. These engines served their time—no, I mean the engine crews served their time on them, down in Oklahoma; they either became obsolete or they passed laws against them so they could not be used in road service and they made switch engines out of them. You know that when an engine gets so it is not fit for road service they can always make switch engines out of them, that is, they don't just exactly make switch engines of them, they put them in yard service. Well, this 1896 is one of those old "Mother Hubbard's" that has had her waist line changed and the cab put back where the engineer and fireman can compare schedules. This

old engine has been cussed by more engineers probably, than any Ford automobile ever was, but she has a lot of good in her yet, all she needed was encouragement; so while Kansas City was working their new modern power through a month without a washout and without having the fire knocked, the old 1896 out on the plains of Texas was doing the same thing. She started in December on a triple crew job and went until January 14th, working 328 hours and 50 minutes when she went in for monthly inspection; she came back out in seven hours and ten minutes and went on the 7:00 A. M. job January 15th and finished out the remaining 404 hours of January and kept right on percolating into February until the government requirements necessitated taking her in to have the stomach pump used on her again. This engine would not have done this any more than a modern engine would unless there was a real engineer on one side and a real fireman on the other side of her, and they would not have done it unless there had been some more real honest-to-goodness railroad men backing them up in it. It pays to sow good seed, especially when you have good ground to sow it in.

We all want to produce the highest grade of service, that is all we live for. Unless we can produce service we have no right to go before the public and ask them for their business; when we cannot produce the service for which the public is required to pay we have no right to further Transportation existence, and in this day of a discriminating public, we will not live long—at least we will not prosper as transportation agencies.

On the Rock Island we have not curtailed service in order to conserve operating expenses—rather, with improved service we have, regardless of the necessity of more expense to provide better service, tried to find ways of conserving operating expenses to offset the natural expense brought about by improved service.

We think we have been reasonably successful in doing this; our operating figures furnished by the Auditing Department show our yard expenses per car handled in January, 1928, was 49.15c compared with 53.68c in January, 1926, and in March, 1928, it was 44.85c compared with 50.51c in March, 1926. This reduction is made in the face of the fact that our yard trainmen have been granted wage increases in March, 1927, over the 1926 scale of wages.

Getting back to our original statement, and in conclusion:

Our success, and we feel that we have been in a measure successful, has been the result of sowing the seed of Confidence, Consistency and Co-Operation. It does not matter what happens, how dark the outlook, how limited our means of progress, if we can retain our faith in humanity; if we have confidence in those at the top and they in us, we can carry on and work out our many problems confronting us. No matter how exacting the demand may seem to us, or what it takes to carry it out, if the demand is consistent with good practices and supported by the confidence of those issuing the demand there is a way to rightly carry it into effect. No matter how consistent the policy, without the co-operation of those who must make the policy a successful accomplishment no great or lasting good may or should obtain.

We have enjoyed all of these things on the Rock Island; we have been doubly blessed with a management standing four-square on the principle of fair dealing with the public and with the employees; the lives of our management manifesting confidence, consistency and co-operation, and it is but natural that such good seed should return to the sowers such a bountiful harvest of good work; it is an honor to anyone to be able to know that they have had even a small part in such a constructive development as we have and are now enjoying.

I have tried not to tire you with what we of the Rock Island have found so much pleasure and profit in doing, but to show you some of the methods we have used and are using to overcome our difficulties, and some of the returns from honest effort.

I thank you for your kind reception, for the opportunity of being here, and for the pleasant time I have had with you, and if what I have said will help you in seeing more of the fruitful field of endeavor, I will have been more than paid for my effort in preparing this paper for you.

CHAIRMAN: I think you agree with me that we have heard a most interesting paper. I see in the audience some men who know a great deal about yard operation, and we should have a good discussion. I hope you will be prompt to help in the discussion. While we are waiting for volunteers, I might call on one who has had a great deal of experience in yard operation, Mr. Dambach.

MR. C. O. DAMBACH: The speaker has evidently given

his paper a great deal of study, and in view of the results he has obtained from practical experience, it would hardly be fitting for me to say anything in the way of criticism.

I might say, however, that Pittsburgh territory is a fertile field for improvement in yard operation, as on account of its geographical situation, sufficient yards have never been provided, which naturally causes delay with respect to the through movement. Referring particularly to time between Chicago and Pittsburgh, would state that when the road I represent came into Pittsburgh, they established second morning delivery from Chicago, and this service is now being performed by our competitors.

MR. FERTIG: What road is that?

MR. DAMBACH: The Pittsburgh & West Virginia Railway.

In the absence of facilities, however, considerable improvement has been made in the way of reducing delays by co-operation. In our own situation, we had a condition that necessitated interchanging cars with one of our connections by trading trains, and as a matter of fact we handled the largest tonnage ever handled with that connection, amounting to as many as eight hundred (800) cars a day, by simply making main track movements and not yarding the trains.

I was very much interested in Mr. Fertig's experience in keeping an engine in continued service for a month without putting it in the shop and will be glad to have the benefit of his experience regarding similar performances if there were any at outlying points.

Was also very much interested in his showing covering the light-weighing of cars, and if the figures are available, it would be interesting to know about how much of this he figures is profit. I appreciate that money can be made in lightweighing cars providing they go over a hump yard, but I was wondering how much, if any money can be made, in case it is necessary to bring the cars in from off the road in order to be light-weighed. That is, how far can you reach out for the cars in order to make any money.

Mr. Fertig quoted some figures showing the cost of handling cars. In order to intelligently analyze, it would of course, be necessary for one to be familiar with the conditions surrounding the particular yard for which the figures were ob-

tained, but it would be interesting to know how he counted his cars in making his calculations.

In connection with further expediting the movement of cars through the yard, I believe there is an opportunity for further improvement by better matching up the time of through schedule. In a recent study of the through schedule from Middle West to Atlantic Seaboard moving in connection with our line, it was found that a whole day could be saved by matching up at Junction points and I assume if the matter was given study, the same condition would be found in other schedules.

Before sitting down, I cannot pass up this opportunity of bringing before this gathering a question which is a personal hobby of mine, in connection with yard performance, and that is to commence laying the ground work that will permit an Industry to furnish billing that will take car to destination, thereby saving delay at original billing point.

MR. FERTIG: About working engines through, the only place we have found trouble in working engines over extended periods of time was where we have had industrial engines or transfer engines that were not regular in returning to the point where they started to work. These are the engines which make the most overtime. If you have the transfer crew going to work at 8 o'clock it may be necessary to start a transfer again at 3:30 in the afternoon with that engine. It may be only one car. It may surprise you to know the number of transfers of only one car. It may be a carload of fruit. If you have to start that engine over to a connecting line at 3:30 you will not be back at 4 o'clock and the crew will earn overtime. And it would not be practicable to start that engine on the four o'clock job because the crew would be waiting for the engine to come back. We do not try to do it except where the jobs match up. There are places on our railroad where we do not work engines through, just on account of this situation. We work about 10,000 jobs on our railroad a month and we haven't anything like 10,000 engines working through. So you cannot do it everywhere, but where you can do it, that is the place to do it. And there are a lot of places where it can be done.

With regard to the cost per car, I do not think the cost per car means anything except to the yard where the cost is applied. You can not compare any two yards. No two yards have the same identical conditions. Different railroads have different methods of accounting. I made a study on the Frisco

and I wondered why their cost was so low. They give their engines credit for every movement made to an industry or freight house or any point in the terminal. If the car goes to the industry they get a count, and the car home a count, back from the industry a count, and a count to the line going out, that is four counts for every car in and out. We give a credit for cars in and out and to and from a connecting line, but no credit for industrial switching. There are four yards where they have excessive mileage in making transfers.

As to the cost per car, that chart (indicating) represents a total operating expense as determined by the Auditing Department, based on the number of cars reported to each of the yards of the railroad. The top figure is the high figure, something over 79c, and the lower figure is about 50c for that year. You will notice all the way down they are much lower than 1923, until in 1927 when the high figure was 50 and the low 40. Our present figure is a little lower than that. Of course the cost per car is influenced by the flow of business handled by the road.

Referring to this chart over here (indicating) that represents the increase in gross ton miles since 1916. 17,000,000,000 in 1916; in 1927 it was 25,000,000,000. That is a 46% increase over 1916 and 19% over 1923. That of course has had an influence on this chart over here. We notice a decreased expense in handling a great many cars. None of the figures I have used are my own figures. Please keep that in mind in connection with the quotation made a while ago about liars and figures!

MR. G. M. PERRY: The speaker referred to overtime. What is the percentage of total time in overtime in the yard?

MR. FERTIG: I will have to answer that just from memory. I have the figures somewhere but can not lay my hands on them just now. I think it was something like 2.05% in 1927. In 1923 previous to starting out the economy campaign it was something like 9%. The first year we decreased it 27%. With the exception of 1927 when we developed the Seminole oil field and had to build two new yards—we had a condition there of just a little water tank town developed into a city of 18,000 in six or eight months, and we had to let those men work enough hours to justify them in working in such a place. With eight hours a day he could not pay his board. We worked those crews 12 and 14 hours a day. That is what ran

up our overtime last year. It is down now. The first four months of this year $11,000 under the first four months of 1923, and two wage increases since.

CHAIRMAN: I wonder if we could have a word from Mr. J. E. Hughes?

MR. J. E. HUGHES: I have been very much interested in the paper as presented by Mr. Fertig. It is a subject that is very much alive on all railroads in the Pittsburgh district, (the cost of yard operation.) I am also interested in the operating cost sheet he speaks of which the yard master has on his desk every morning when he comes to work for the service performed the day before. I would like to know just how that cost is computed.

MR. FERTIG: This report, which we term C. T. 5 2-a, shows all the yard engine expense first, number of hours and wages paid, number of overtime hours and wages, which gives total yard engine hours. Then on our railroad the switching performed by the transportation department for the mechanical department is not charged to transportation but is charged to maintenance of equipment, and that is deducted from the total yard engine hours. He keeps a record of the switching performed and unless it is two hours a day it is not counted. After he takes out departmental switching he has the transportation yard switching for which he is responsible. Then he has, if any, switch tenders and pilots and back up men, showing their wages. Then his yard masters, including relief yard masters, and all his clerical expense, which gives him total transportation yard pay roll. That is what he bases his cost per car on. Then he takes all the inbound cars and all the outbound cars. And if he cuts out or adds to passenger trains he gets credit for the cars cut out or added. Then freight cars from connections and to connections. Those added together, and total transportation pay roll divided by these cars, gives the cost per car.

A portion of the report is cumulative figures since the first of the month. He adds the figures for today to the figures for the previous days from the first of the month so he knows exactly what he has spent since the first of the month. On our railroad we have the budget system for yard expense, station expense, train expense, engine house expense and yard expense,

and allocate a certain amount for the month to each item, so the yard master has a check every day on how much he has spent of his allowance, and so does the superintendent and the train master and the general superintendent.

MR. HUGHES: Has the yard master the privilege of increasing or reducing his power each day on his own authority as the business warrants?

MR. FERTIG: He has.

MR. HUGHES: What is your average terminal delay?

MR. FERTIG: That would be a big job to cover any particular length of time. But in November of last year the Frisco sent representatives to our railroad to study these forms at Kansas City. That was the 21st of November. From the 1st of November up to that date there had not been a single delay of freight trains out of Armordale terminal. So he asked what you have just asked me. I said, "I do not know, but I will find out. Our delay is not very much." I went back to the office and took the entire month of October and averaged the delay per freight train operated that entire month over the railroad and it was 27 minutes. That was the average. Something like 5,000 or 6,000 trains we had to check.

MR. HUGHES: Do you have a departure yard where you advance trains after they are completed and the road crew goes there for them?

MR. FERTIG: No. We haven't a hump yard on our railroad, for which we are thankful. Our trains are made up in the yard from which they depart. We have Air testing tracks in those yards, but we do not have what you would call a departing yard. Our classification tracks are our train tracks.

MR. HUGHES: We find a great deal of economy in having trains inspected and tested before the road crew is called; then when the road crew reports, the train will instantly depart from the yard without any delay.

MR. FERTIG: I would say that was true in our Kansas City terminal where we put in those air lines.

MR. HUGHES: Where your work is continuous, working three crews eight hour tricks, how much lost time do you have in 24 hours?

MR. FERTIG: That runs different in different months. In October, which is a very favorable month, our average on those engines we worked at Kansas City was 32 minutes per day per engine. It took 32 minutes to put that engine in shape. When it came to December the Yard Master said there had been days when he lost one hour.

MR. HUGHES: One hour each trick?

MR. FERTIG: No, once a day, for government inspections as required. In December in bad weather it ran up as high as an hour. Then always got in the lunch hour and they used forty minutes.

MR. HUGHES: Do you find any economy in "peddling" a good live engine to this point and one crew steps off on to a good engine and have the "peddling" crew take the engine to be hostled?

MR. FERTIG: We could not do that at Kansas City because we do not have that engine to "peddle."

MR. HUGHES: If you had 35 crews and lost 32 minutes every 24 hours you would have enough engines to work out the "peddle" service and save some engine hours.

MR. FERTIG: Not with the class of power we had. We did that on our light jobs where there would be thirty minutes or more between starting time of jobs. But they did not get 24 hours a day.

MR. HUGHES: Do you find any economy in pushing road trains out of the yard?

MR. FERTIG: Not from a yard standpoint. You would find economy from one standpoint in that you could give the train more tonnage. Where we do that regularly the yard service gets credit for helper service in operating expenses.

MR. HUGHES: Do you not find that your road crews get the trains out of a yard on most of the divisions in much less time than they would if they had to drag their trains ten or fifteen miles from the terminal to get the train going? It cuts your road overtime down in the aggregate.

MR. FERTIG: Really I could not answer that because we do not have conditions of that kind. We do shove trains out of Kansas City terminals and they go 147 miles in 7 hours.

MR. PERRY: How rigidly do you hold the yard masters to that budget?

MR. FERTIG: It is just like everything else, if he makes it it is fine, if he doesn't, it is too bad. It is something to shoot at. It gives him a check on it.

MR. HUGHES: What do you find is your average time consumed in cleaning and hostling engines—on a Turn-around? Where you have a crew coming in and you want the engine turned and sent right back and the crew is waiting, what is the average time consumed on the ash pit? Our Assistant General Superintendent of Motive Power is here and I would like to have him hear what you do on the Rock Island?

MR. FERTIG: I do not know. I wish I could tell you. Really the turning of power at the engine house on our railroad is strictly a mechanical proposition. It is not a part of our work to check that part of it. When we check the turning of power it is more from a transportation standpoint, as to why they don't get more power back. I like to get these ideas, and I am going to look into it.

MR. HUGHES: We have a very good record in doing that and I think we might have something to shoot at, I don't know. We have a record of turning engines of about 20 to 22 minutes and we think that is about as well as can be done.

MR. FERTIG: I should say it is. Where do you do that, at intermediate terminals?

MR. HUGHES: That is the end of our division. And we frequently have turn arounds where we are required to turn an engine quickly, and I think Mr. Berg can bear me out, that we

took out all the slack there was in it some time ago. And we pride ourselves in being able to turn an engine in 20 to 22 minutes.

MR. C. W. EMERY: Where you have three 8-hour turns, what is the average detention at the relief period in changing crews?

MR. FERTIG: We have not found that at points where we successfully work power through, that there is any delay. One crew gets off the engine and the other crew gets on. The delay we have is in taking care of that engine during lunch period of one of the crews. We put them to work where the engine is instead of sending the engine to where they are. I understand some of the eastern lines have a contract with the firemen that the firemen will not be required to fire the engine that hasn't the fire cleaned for 16 hours. Of course that precludes the use of that system.

CHAIRMAN: We have one of our older members here who came over from Cleveland just to listen to this paper. He is not directly interested in yard operation, but he has been in the transportation business all his life. Mr. John F. Lent, from Cleveland.

MR. J. F. LENT: I have been very much elated over the paper, in the vernacular; but an operating man being somewhat different, it is with some timidity that I would undertake to discuss the subject. However one of the matters which we see, this efficiency in operation in a downward operating cost, sends the traffic man's thoughts at once to lower freight rates. While this can not be claimed universally, and is not claimed always in the cases before the Commission, I do think that the personal equation the speaker has brought out, as affecting this economy goes so far to the correction of high operating costs that not only the operating man should take a live interest in trying to rival the other fellow—as I caught the spirit of this thing in bringing this about—to reduce the operating costs and therefore make the railroad more efficient in serving the public.

It is a great pleasure for me to get to this meeting. I used to be one of the diligent attenders and I got a great deal of pleasure and instruction out of them. I will say that the paper tonight has impressed me as few papers have in the past.

It comes from actual experience and is given in words we can all understand, and it is out of practical, actual operation and is not theoretical. And in that I commend the speaker most highly for the paper.

CHAIRMAN: Sometimes we railroad people like to wait a little time to think things over before we express ourselves in public. It is getting a little late, and any one who would like to comment on the paper in writing may do so, and if he will send his comments to our Secretary he will be glad to take care of them.

Before we reach the order of business which takes us to the usual lunch I would like to call on some one who never fails to make appropriate remarks when called on, usually right to the point. Professor Endsley.

PROFESSOR L. E. ENDSLEY: This paper tonight can be brought home to all of us, of what interest would an athletic contest such as a ball game be if no score were kept. Now would not that be interesting. This thing of running a railroad and getting the man in a frame of mind where he will compare his game with the other fellow's game or with the last game played. He may not have any efficiency, but if he plays his game today in 40 and the next time he does it in 38, he will be improving. How can you expect to get them interested unless you keep just such a record as the speaker has told us about? That method of keeping record gets every man up on his toes and you get all the men interested in the game. Everybody likes to play some game. Some like golf. Some like bridge. Some like checkers. Some like chess. I like all four of them. So the game of railroading should be kept in some record so the men can see who won the game.

I have enjoyed this paper very much tonight and I am glad to have been here, and I would like to make a motion that a vote of thanks be extended to the speaker of the evening for his very excellent paper and for the delightful way in which he has presented it to us.

MR. FERTIG: The next time you want a really good speech, get my statistics and Professor Endsley's oratory.

The motion tendering to the speaker a vote of thanks was duly seconded and carried by unanimous rising vote.

Upon motion, duly seconded, meeting adjourned.

J. D. CONWAY, Secretary.

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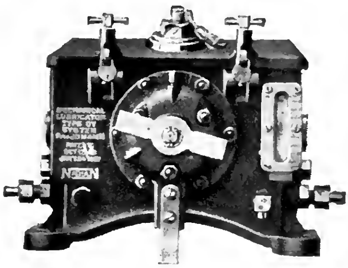

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OFFICIAL PROCEEDINGS
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SAFETY PROBLEMS IN COAL MINING

By H. P. GREENWALD, Supervising Engineer, Experimental Mine Section, United States Department of Commerce, Pittsburgh, Pa.

RESERVED

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A. G. MITCHELL	November, 1912, to October, 1914
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J. G. CODE	November, 1916, to October, 1917
*D. M. HOWE	November, 1917, to October, 1918
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H. H. MAXFIELD	November, 1919, to October, 1920
FRANK J. LANAHAN	November, 1920, to October, 1921
SAMUEL LYNN	November, 1921, to October, 1922
D. F. CRAWFORD	November, 1922, to October, 1923
GEORGE D. OGDEN	November, 1923, to October, 1924
A. STUCKI	November, 1924, to October, 1925
F. G. MINNICK	November, 1925, to October, 1926
G. W. WILDIN	November, 1926, to October, 1927

*—Deceased.

Meetings held fourth Thursday of each month except June, July and August.

PROCEEDINGS OF MEETING

September 27, 1928

The meeting was called to order at the Fort Pitt Hotel at 8:00 o'clock P. M., with President E. J. Devans in the chair.

The following gentlemen registered:

MEMBERS

Allen, E. J.
Allen, Harvey
Allison, John
Altsman, W. H.
Beam, E. J.
Berg, Karl
Bishop, C. L.
Bonhoff, E. L.
Borchers, E. A.
Bowen, James T.
Campbell, James E.
Campbell, J. T.
Christy, F. X.
Cohen, Alfred J.
Conway, J. D.
Courtney, H.
Cruikshank, J. C.
Cunningham, J. L.
Davis, Charles S.
Dempsey, P. W.
Devans, E. J.
Ebenhack, Omar C.
Emery, E.
Endsley, Prof. Louis E
Fisher, Harry G.
Gardner, George R.
Glaser, J. P.
Haller, Jacob
Haller, Nelson M.
Hamilton, William
Holmes, E. H.
Hughes, John E.
Irwin, R. D.
Jungbluth, Adolph
Kelly, L. J.
Kirkpatrick, R. L.
Kroske, J. F.
Lanahan, Frank J.
Lanahan, J. S.
Laurent, George F.
Lawson, A. F.
Leckey, Ralph F.
Lewis, Walter M.
Lobez, Pierre L.
Ludgate, B. A.
Lynn, Samuel
Maurhoff, E. R.
Millar, C. W.
Milliken, Col. J.
Morris, J. H.
Moyer, Oscar G. A.
Myers, T. P.
McAbee, W. S.
McIntyre, R. C.
Nash, R. L.
O'Connor, M. J.
O'Sullivan, John J.
Painter, Joseph
Paisley, F. R.
Posteraro, S. F.
Ralston, J. A.
Reifsnyder, J. W.
Rizzo, C. M.
Rogers, Robert
Roth, Philip J.
Sattley, E. C.
Searles, E. J.
Semethy, J.
Shannon, David E.
Simons, Philip
Snyder, F. I.
Stark, F. H.
Stevens, L. V.
Stoehr, Arthur P.
Stoffregen, Louis E.
Stoughton, S. J.
Stucki, A.
Sykes, Arthur H.

Tate, R. G.
Trance, F.
Trust, J. F.
Vandivort, R. E.
Van Vranken, S. E.
White, A. B.
Wildin, G. W.
Woodward, Robert
Wright, O. L.
Wynn, Charles A.
Wynne, F. E.

VISITORS

Davis, W. B.
Doane, F. B.
Downton, Charles E.
Greenwald, H. P.
Hall, Chester C.
Halloran, M. J.
Howell, S. P.
Jungbluth, Herbert A.
Lewis, S. B.
Minich, R. H.
McClymonds, John V.
O'Toole, Thomas J.
Pugh, A. J.
Reeve, F. J.
Smith, Sion B.
Tate, Paul R.
Thomas, Harold N.
Tonkin, E.

The call of the roll was dispensed with, the record of attendance being obtained through the registration cards.

The reading of the minutes of the last meeting was dispensed with as they have appeared in printed form and been distributed to the members.

The Secretary read the following list of applications for membership:

Ebenhack, Omar C., Traffic Department, Pittsburgh Coal Company, P. O. Box 64, Pittsburgh, Pa. Recommended by George R. Gardner.

Doane, F. B., Chemical Salesman, Pittsburgh Testing Laboratory, Stevenson and Locust Streets, Pittsburgh, Pa. Recommended by Col. J. Milliken.

Moxey, Arthur C., Railway Salesman, Scientific Production Corporation, 311 West Cunningham Street, Butler, Pa. Recommended by W. H. Alstman.

McGinnis, Thomas P., District Sales Manager, Pyle-National Company, 2241 Oliver Building, Pittsburgh, Pa. Recommended by Henry F. Gilg.

O'Malley, J. N., Foreman, B. & O. R. R. Co., 5130 Second Avenue, Pittsburgh, Pa. Recommended by Joseph P. Kane.

O'Toole, Thomas J., Clerk, B. & O. R. R. Co., 5138 Gloster Street, Hazelwood, Pittsburgh, Pa. Recommended by J. T. Campbell.

Paisley, F. R., Inspecting Engineer, P. & L. E. R. R. Co., 1111 Stanford Road, North Side, Pittsburgh, Pa. Recommended by J. F. Endean.

Richardson, L. C., Sales Engineer, Sunbeam Electric Manufacturing Company, 1720 Grand Central Terminal, New York, N. Y. Recommended by J. D. Conway.

Smith, E. W., Vice-President, Pennsylvania Railroad, 909 Pennsylvania Station, Pittsburgh, Pa. Recommended by H. E. Passmore.

Stoughton, S. J., General Manager, Pittsburgh Cleanser Laboratory, 1216 Metropolitan Street, North Side, Pittsburgh, Pa. Recommended by S. E. Van Vranken.

PRESIDENT: These applications will be referred to the Executive Committee, in accordance with our By-Laws, and upon approval by them, the gentlemen will become members without further action.

SECRETARY: Since our last meeting we have received word of the death of the following members: W. H. Frey, Rody P. Marshall, J. L. McCartney, F. H. Parks and W. O. Quest.

PRESIDENT: An appropriate memorial minute will appear in the next issue of the Proceedings.

This is the time when, under the By-laws, it is necessary to appoint a Committee to make nominations of officers for the ensuing year, to be elected at the October meeting. I wish to announce the appointment of the Nominating Committee as follows:

Mr. Frank J. Lanahan
Mr. George W. Wildin
Mr. A. Stucki

And I will ask the Committee to report before the close of this meeting.

Has any member anything he wishes to submit to the Club? If so, opportunity is afforded at this time.

MR. J. E. HUGHES: (Chairman of the Membership Committee). Mr. President and Gentlemen: In checking up with the Secretary I find we have 1,259 members in the Club. We have just one more meeting for the current fiscal year, and as Chairman of the Membership Committee I wish especially to

appeal to the membership, to those who are present tonight, and to those whom you may meet outside, to whom I hope you will make this appeal, to bring in a few applications at the next meeting. Last year we had 165. With a little extra individual effort we can make it 200 this year. Will you do it?

(The appeal enthused a number of the members to promise to produce numbers of applications running from two to ten each.)

PRESIDENT: Before we proceed with the paper of the evening, we have with us tonight one of the old members, a past President of this Club who unfortunately has not been in position to attend our meetings as regularly as he used to do, and he says he has missed something by not being with us for a few months. I am sure we have missed him as much as he has missed us. We would like to hear a word from Mr. Stark.

MR. F. H. STARK: Mr. President and Gentlemen:—I appreciate the honor of being called on, though I realize that I am not of sufficient importance to be singled out on an occasion such as this. However I am glad to be here and to meet so many of the old acquaintances. We miss some of them very very sadly. It does not seem like a meeting of the Club not to have Dave Redding here, and McFeatters and a lot of the old boys. But nevertheless the Club is growing and doing splendid work and I am proud of it.

I am not in position to criticise or make suggestions, but sometimes I wonder whether the subjects that are presented are not a little outside of the realm in which most of the railroad boys are interested. Years ago we used to have very commonplace subjects, and the men in the ranks used to come out and get into the discussion until it was hard work to stop them from talking. I appreciate that this is a new age. The younger generation coming are mostly college men and they of course present subjects in a manner far in advance of us old timers. But would it not be well to inject once in a while some old fashioned commonplace subject which everybody will understand and will be able and willing to discuss.

I have always had a warm place for this Club. I have been in it about 27 years. In the old days there were a few of the older members who used to make it their business to go around and encourage us young fellows to speak up in meeting. I remember L. H. Turner used to come around to me and say,

"Frank, I want you to make a motion for a vote of thanks to the speaker." Another time he would want me to make some other sort of motion. I had no idea at that time what his motive was, but it was to get me up on my feet. That was his way of encouraging and developing speakers among the younger men.

I thank you very much for the courtesy you extend to me.

PRESIDENT: We would like to hear a word from some of the other old timers. Mr. Wildin?

MR. GEORGE W. WILDIN: I am not an old timer. I may be baldheaded but that is no sign that I am an old timer. I do want to say one thing on the subject of discussions, and to suggest one possible reason why you do not have better discussions. Most of us come here as I do tonight, without knowing what the speaker will bring out and without knowing very much about the subject to be presented. The speaker has spent weeks and maybe months in preparing the material for his address. It would be folly for most of us to get up and try to criticise or discuss his paper impromptu. The only man I know who can do that is my side partner here (Professor Endsley). He can always say a lot-sometimes.

I wonder if we could not get these papers long enough before the meeting that we might make duplicate copies and send them out to at least half a dozen or a dozen members who would be able to intelligently discuss the subject. When the discussion is once started, the young fellows may find something to ask questions about. It is unfair to the young members of this Club to ask them to get up and speak without preparation upon such technical subjects as we have presented at these meetings.

MR. SAMUEL LYNN: There is something in what Mr. Wildin has said I do not know that I would be in favor, however, of sending out a copy of the paper in advance to all the membership. You might hear from some of the members the expression that they had read the paper and did not care to hear it again. But twelve or fifteen copies to selected members, especially familiar with the subject, would I believe add to the value of the discussion.

PROF. L. E. ENDSLEY: I am a 14-year-old timer, that

is all, and I never miss a meeting when I am in the city. I have been on the Subjects Committee three years. We have always tried to get something that was interesting and something the members would come out to hear. I do think it would be a good thing to send out copies of the paper to a few men who would be able to say something of interest on the subject. There was a time when the Western Railway Club printed the whole paper and sent it out ahead. They quit that. It is pretty expensive and it is pretty hard to get the papers out in time. But we can all ask questions. And if we get up before the meeting and join in the discussion we go home feeling good.

PRESIDENT: I am sure there has been no intention on the part of any of the speakers to critise the subject of this meeting. But we have not been getting the discussions of the papers that we would like, and from that point of view I am rather inclined to agree with Mr. Stark that we ought to have a few more commonplace subjects, which the members generally would feel competent to discuss.

I have been a member of this Club eleven years. A baby member. I have been a member of the Central Railway Club of Buffalo for 25 years and I have been a member of the New York Railway Club for the last three or four years. Some years ago the Central Club just slumped. I came down here and talked with John Conway. At that time you had a wonderful turnout. He gave me a lot of good pointers, which I took back to the officers of the Central Club. Their membership came back from about 600 to more than 1,800 and at the present time they do not have less than 400 at regular meetings. One of the things that gave that start was a campaign to get out the young people. And there is a lot that the older members of the Club can do right here to increase the membership and also the interest of the younger members.

We come now to the paper of the evening and I take pleasure in introducing Mr. H. P. Greenwald, Supervising Engineer, Experimental Mine Section, U. S. Department of Commerce, Pittsburgh, Pa., who will address you upon the subject, Safety problems in Coal Mining.

SAFETY PROBLEMS IN COAL MINING*

By H. P. GREENWALD†

Supervising Engineer, Experimental Mine Section, United States Department of Commerce, Pittsburgh, Pa.

I desire to bring before you some of the efforts that are being made to reduce the number of accidents which occur annually in the coal mines of the United States. In order to understand the problem thoroughly I will give some statistics on accidents during the year 1926. This was a good year in so far as the fatality rate was concerned. Only three other years since 1870 can show a better record, and in two of these the difference is small. In 1926 a little more than 663,000,000 tons of coal was mined and 2,514 men were killed by accidents. If we assume 250 days as average working time for the mines, 10 men were killed every day. The total fatalities in the year were equivalent to removing the entire adult male population of a town the size of Latrobe. On a production basis there was one death for every 264,000 tons of coal mined.

Principal Causes of Fatalities

The principal causes of deaths in coal mines and the percentage of the total attributed to them in 1926 are:

Cause	Per Cent
1. Falls of roof and coal	48
2. Haulage accidents	17
3. Explosions of gas and coal dust	17
4. Explosives	4
5. Electricity	4

These five causes were responsible for 90 per cent of the deaths. The remainder, 10 per cent, was due to a number of causes not sufficiently important to be considered here. I propose to consider chiefly explosions of gas and dust because it is the subject on which I have worked for a number of years, also because it is the most spectacular and to the general public the best known cause of deaths in coal mines. The other four causes may be considered briefly before proceeding.

Falls of Roof or Coal

The uninitiated person is usually surprised to find that nearly half of all the deaths in mines are due to one cause

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†Associate physicist, U. S. Bureau of Mines.

which receives little publicity. When a miner is killed by a fall of roof or coal the matter, if recorded in the papers at all, appears in a small paragraph in some corner where it may be easily overlooked. It is seldom that more than two miners are killed by a single fall, but individual accidents form a large share of the total. These accidents occur so regularly that to the industry and the papers they are not "news" and no publicity is given to them. Yet the total deaths in a year approach closely the number due to all other causes.

A study of falls of roof and coal is now one of the major problems of the United States Bureau of Mines. Wherever coal is removed, the support which it gave to the strata above it is taken away and the weight must be re-distributed onto new supports or the remaining coal. The coal remaining usually takes a large share of the load and the roof strata between the coal supports become a continuous beam uniformly loaded. Extra support in this beam may come from timbers or in narrow places with good roof timber may be omitted. Most of the accidents occur near the faces where coal is being removed and where timber has not yet been permanently placed. Roof strata vary widely in strength and character. They may be strong or weak and they may have definite planes of cleavage which cause them to fall in blocks. They may remain unaffected when exposed to air or they may disintegrate. Because of this the support of roof becomes a separate problem for each mine and the solution is also affected by the method of mining used. Reduction in the number of deaths can best be brought about by a study of methods of timbering and education of the miner and mine officials in the proper methods of preventing falls of roof; also in close supervision and direction of the miners. It also means that the miner must take no chances with roof which may be dangerous.

Immediately overlying the Pittsburgh coal bed is a layer of hard slate averaging about a foot thick commonly known as draw-slate. This slate, although very hard, has little strength and deteriorates rapidly when exposed to air. It must be taken down as soon as the coal has been removed and sometimes falls down with the coal when shots are fired. The miner likes to keep this slate up until his coal is loaded as he can then throw it all down without mixing it with the coal. Many of them take chances loading coal under slate which should be taken down or should have additional timber supports; the

number of deaths due to falls of this slate is sufficient evidence that proper care is not taken.

Haulage

Haulage accidents were tied with mine explosions for second place in causing deaths in 1926. Individual haulage accidents like falls of roof usually claim only one or two lives. At times an accident is recorded which involves a larger number, but these are the exception rather than the rule. Coal mine haulage is a serious problem. It resolves itself into concentrating the production from a number of points to the place where it is taken to the surface. The points of production advance steadily and track construction must follow it. What kind of construction is used depends upon the amount to be hauled, the method of hauling, and the length of time the track will be in use. The principal causes of haulage accidents are collisions, derailments, and runaway cars. As practically nothing but single track is used and there is usually no control over movements except near shaft bottoms, collisions can occur easily. These frequently involve mining machines which move from point to point under their own power without reference to the electric locomotives which do most of the hauling. Derailments may be due to defective equipment or to falls of roof or to material spilled from overloaded cars. Steep grades are frequently encountered underground. They may be short enough for a locomotive to haul over them by the momentum of a flying start or they may require rope haulage. Broken couplings on these grades cause frequent runaways. Such a runaway usually ends in a wreck and it is fortunate if no one happens to be in the way.

Explosives

Turning now to explosives and electricity we find that each caused 4 per cent of the fatalities in 1926. Any person who abuses explosives is liable to pay for his folly with his life. I think it is safe to say that there is much greater care taken in the manufacture and transportation of explosives to the coal mines than there is in their handling and use after they reach the mines. Prevention of accidental discharge of explosives resolves itself into proper care and handling of them from the time they are unpacked on the surface until they are exploded in the borehole. They must be kept away from electricity and fires, fundamental precautions which every railway man knows, yet many a miner has died because he handled

explosives with an open light on his cap. A miner should not be permitted to have more explosive than he will use in one shift. He should know how to drill and load his holes properly, and firing should be done by battery and not by fuse or squib. A better system takes the handling of explosives away from the miner and places it in the hands of shotfirers, each of whom serves a group of miners and does nothing else. Under another system in use in some western mines all shots are loaded and connected to a single shotfiring system after the miners have left. The shotfirers then withdraw and fire all shots at once by connecting the shotfiring system to the power line outside the mine.

Electricity

Accidents with electricity—that is, direct contact with electric circuits—are more likely to prove fatal underground than in many other industries because of the damp conditions usually existing. A miner's clothes and his shoes become damp and if he comes in contact with a live line, the circuit to ground is only too easily made. The early installations of electrical machinery underground were undoubtedly poor. They were taken from street-railway practice and the material was not suited for its new use. The street-railway voltage, 550 d.c. was also adopted and direct contact within a damp mine almost invariably meant death. Modern systems rarely carry more than 250 volts d.c. except where high-tension lines are carried in armored cable to underground sub-stations. Poorly guarded trolley wires are responsible for many deaths and in most States the law requires guards at all intersections. Reduction of accidents from electricity can be brought about by proper installation and maintenance of equipment, and by the employes who handle this equipment exercising proper precautions with it. Modern mining would not be possible without electricity, yet there is no reason why it should be allowed to get out of its proper position as servant and become master of man.

Mine Explosions

Gas

I have reserved the discussion of mine explosions to the last, largely because this is the safety problem with which I have worked for the last 14 years. When and where the first mine explosion occurred is not known, except that it was probably in England where coal mining was first developed extensively. Underground workings did not progress far until

methane gas was encountered. Methane is a simple compound of carbon and hydrogen and is the principal constituent of the natural gas which we all burn in our homes. When mixed with the proper proportion of air it explodes violently. The miners name for methane is firedamp, the word "damp" being a generic name for all gases. Firedamp has been the bane of coal mining. It may be given off from roof, coal, or floor. It may issue fairly uniformly from the strata or it may come from cracks and crevices as blowers which resemble minature gas wells. There is only one way to prevent accumulations of this gas where it is being liberated, and that is to ventilate the place thoroughly and continuously with a strong current of air. The methane is then diluted and swept away. In the early mining history of England, ventilation was poor and in parts of some mines was a name rather than an actuality. Methane was encountered in such quantities that it was impossible to work with the ordinary open lights of the day and this led to the invention of the safety lamp by Sir Humphrey Davy. The principal of the safety lamp is simple. The flame is enclosed in a fine wire gauze. Gas burning inside this gauze is cooled as it passes through the meshes and the flame can not be communicated through the gauze. There are limits to this of course. A high velocity air current can blow the flame through the gauze or continued burning of gas may heat the gauze and allow the flame to pass. However, if any quantity of gas enters the lamp at one time it extinguishes the flame because there is not sufficient oxygen to support both the burning gas and the flame of the wick. The modern safety lamp bears little external resemblance to the original Davy lamp, but its operation is based on the cooling effect of wire gauze, and it is an important factor in mine operation. A competent person can detect and estimate the quantity of methane in an air current with a safety lamp when there is as little as one per cent. Five per cent is the lower explosive limit. For purposes of illumination the safety lamp has been largely displaced in the United States by the electric cap lamp. This consists of a wet battery which the miner carries in a suitable container strapped to his belt. The lamp is fastened to his cap and a 2-wire cord connects it with the battery. There are several types of lamps on the market, but the one designed by Edison has had the largest sale. It weighs 5 to 7 pounds.

I have frequently thought that these lamps could be used to advantage by railroads or other industries where men must

enter dark places at irregular intervals and an open light is dangerous. This applies to grain elevators and the holds of ships being loaded with grain, pitch, or coal.

It is not always possible to have good ventilation in mines. Despite the best intentions, accidents or carelessness may derange it and open lights, flames, or sparks which may ignite methane should not be allowed in coal mines. This includes electric sparks and it is not safe to use trolley locomotives in gassy mines except on fresh intake-air currents. Commutators, switches, etc., must be enclosed so that they will not ignite gas. The Bureau of Mines has developed, in co-operation with the manufacturers, a wide variety of electrical machinery commonly designated as "permissible" machinery which has been tested and found incapable of igniting explosive methane-air mixtures.

Coal Dust

But the end of the miner's troubles are not in sight when he has conquered methane. Bituminous coal dust will explode as violently as methane and generally with greater resultant damage, because it is spread throughout the mine, whereas the methane accumulates only locally. There can be no doubt that every widespread explosion in a coal mine has been propagated by dust, irrespective of the manner in which it started.

A study of the explosibility of coal dust was forced by a series of disasters in the year 1907. In the first 11 months of that year eight explosions claimed 181 lives, and then in December five explosions killed 701, a grand total of 882 for the year. Admittedly something had to be done about it, and Congress made an appropriation for investigation which later led to the organization of the United States Bureau of Mines. The study of coal-dust explosions was carried on principally at the Experimental Mine which was developed near Bruceton for that purpose. The first experimental explosion was made in the fall of 1911 and the work has continued since that time so that today more than 1,000 such tests have been made. A description of the Experimental Mine would require more time than is available, therefore I will give merely a brief summary of the findings. To have a dust explosion there must be a cloud of the dust in air and a means of igniting the cloud. Dust explosions in mines are not more frequent because these two requirements happen in conjunction only at comparatively

rare intervals. Bearing this in mind. I may state that there are six factors affecting the explosibility of coal dust, as follows:

1. Composition of the coal.
2. Size of the dust.
3. Methane in the air current.
4. Position of the surface on which dust is deposited.
5. Strength of the source of ignition.
6. Configuration of the workings.

These factors will now be discussed briefly:

1. Effect of composition.—Different coal beds vary widely in composition and the explosive properties of the dusts vary in like manner. In general, the explosibility increases as the proportion of volatile matter in the coal increases. Anthracite dusts that contain less than 10 per cent volatile matter are not explosive. As the volatile matter increases from 10 to 20 per cent there is a rapid increase in explosibility. Above 20 per cent volatile the increase is less rapid. Coal beds containing 35 per cent or more volatile matter generally produce the most explosive dusts; the Pittsburgh bed falls in this class. Probably the most explosive coal mine dusts in the United States are those found in the mines of Utah.

2. Effect of size.—The finer the dust the greater is its explosibility. This would be a reasonable conclusion even if there were no tests to support it. An explosion is the combustion of the coal dust particles and the rate of combustion increases as the surface of the coal particles is increased. As dust is made finer, the surface exposed by a given weight increases rapidly. The finer particles are also more easily suspended in the air and do not settle as rapidly, hence formation of a cloud of coal dust is facilitated. The question naturally arises, how coarse must particles be before they cease to be dust? As a result of experiments it has been decided that in so far as explosibility is concerned, the division shall be made by a 20-mesh sieve, which is one having 400 holes to the square inch. Material which passes the sieve is dust, but that retained by the sieve is not dust. This may appear to be somewhat arbitrary, but the fact remains that the presence of the coarser material does not affect an explosion which has developed in the finer.

3. Methane in air current.—Where the strata in a mine give off methane, this gas is present in the air current on the down-

stream side of the place where it is given off. If a coal-dust cloud is formed in this air and ignited, the explosion takes place in a mixture of dust, methane, and air. The proportion of methane may be small, frequently less than one per cent, yet it has a definite effect in increasing the explosibility of the dust and this effect has been studied and determined.

4. Position of dust.—Let us suppose that we have a given quantity of a certain dust and scatter half of it over the roadway of a mine, the remaining half being placed on the timbers which cross the roadway at the roof: Some disturbance then happens which forms a cloud of this dust. The dust on the floor has to be raised in the air against the force of gravity, while that on the timbers has merely to be dislodged to form a cloud. Because of its position, the timber dust is the more dangerous and will form a dust cloud more readily than dust on the roadway. Also, in a mine the timber dust reaches its position by floating in and settling out of the air, consequently it is much finer than the dust on the floor. It is evident then that the position which a dust has in a mine passageway influences its explosibility.

5. Strength of igniting source.—It can be determined by experiment that coal-dust clouds may be ignited by one source and not by another. If an easily ignited cloud such as that of Pittsburgh coal dust is present, it will be found that a small spark such as occurs when the circuit of a door bell is broken will not ignite the dust, but a continuous arc carrying 5 or 6 amperes will cause ignition easily. Tests have been made in which an insensitive coal dust was not ignited by an arc carrying 100 amperes at 250 volts, but ignition was caused readily by the flame of black powder or of a gas explosion. The precautions to be taken must then depend on the hazards which will be met and no general statement can cover all cases.

6. Configuration of workings.—Tests have shown that retention of pressure behind an explosion increases its velocity and violence, but release of pressure causes the explosion to slow down and become less violent.

The physical properties of an explosion will depend upon the shape and size of the passageways in which it takes place. It will also be influenced by the presence of obstructions such as cars and by openings into other passageways.

The foregoing will give some idea of the complicated problem which coal-dust explosions present for solution. Whether

we will ever be able to present a final answer I do not know. Certainly we appear to have as much work ahead of us as we have done.

Finally, let us consider how dust explosions are to be prevented. If a dust cloud and a source of ignition are necessary it would appear logical to prevent formation of the cloud and remove all sources of ignition. The latter is along the same line as removing sources of ignition of methane and should be done. The former could be done only by removing the dust and this is not practicable in a coal mine. Instead, the dust should be rendered non-explosive. This is done by mixing ground inert dust, such as limestone dust, with it. If a dust cloud is formed the inert dust prevents combustion of the coal dust. The best hope of preventing coal-dust explosions is in the widespread and complete use of this method.

Now, having surveyed somewhat the problems that must be solved to promote safety in mining I may conclude with the statement that safety will be greatly promoted by education; also, the largest group to be educated are the miners themselves. As a rule they are a group who have not enjoyed fully the educational possibilities which have been the portion of those assembled at this meeting. Many of them are foreign born and their grasp of English is limited, but all can learn by what they see and the motion picture has been an important aid in the Bureau of Mines' safety work. I have with me this evening a single reel which is designed to be shown at gatherings of miners. It is entitled "Twelve Points of Safety" and emphasizes certain points which I have discussed.

(At this point the moving picture mentioned was thrown upon the screen.)

PRESIDENT: I do not know how many of you are interested, either directly or indirectly, in mines and their operation. I do know that we are all interested very much in safety and I am sure we all appreciate the very interesting lecture and the pictures. I am not going to call on any one in particular to participate in the discussion but will throw the subject open for general discussion, except that I will ask Mr. Howell, of the Bureau of Mines, if he will say something on the subject.

MR. S. P. HOWELL: (Explosives Engineer, U. S. Bureau of Mines.) I had not expected to say anything regarding safety

in the mines. But there is one subject touched on by Mr. Greenwald with which I am more or less familiar, and that is the storage, handling and use of explosives in coal mines. We find from statistics that only about 4 per cent of fatalities are caused by explosives such as in handling or by misfires. In the mines where I have been and in some of the mine explosions which I have recently investigated I have been impressed with the necessity of taking unusual precautions when innovations occur. And in regard to explosives there is now occurring an innovation. Up to recently most of the shots fired in coal mines were fired with caps or fuses or squibs, and many are so fired at the present time. But explosives are being fired much more by means of electric blasting caps, or, as we term them, electric detonators. This is being promoted by the U. S. Bureau of Mines because they believe it is in the interest of safety. Fuses and squibs both require means of igniting. And if we are to keep sparks and flame out of coal mines and we believe there should be no flame of any kind to ignite either gas or dust, then we must resort to electric firing.

However, there are two points regarding electric firing that in my judgment need emphasizing. One is that since electricity is commonly used in mines, there are many sources from which electric detonators may be inadvertently or prematurely fired. There is a very simple precaution that can be taken to prevent this, namely, the electric short-circuiting of the legs of the electric detonators, which is done by either twisting the wires together or by shunting them in some other way, and maintaining that short until these legs must be connected up to the shotfiring cable.

Another point is that many of the batteries commonly used in coal mines have live exposed terminals that may cause premature explosions. There are several permissible electric firing devices which do not have a live exposed terminal, which are safe on that account and in addition are permissible in that they can not ignite gas.

So I wish to stress that while we believe that electric detonators should be more commonly used for safety, these two precautions should be taken, the shorting of the legs of the detonators and the use of only permissible blasting units.

PRESIDENT: I did not mean by what I said to restrict discussion. We would be very glad to have any one discuss it or ask any questions that may arise in your minds.

COL. JAMES MILLIKEN: I understood the speaker to say that in 1926 there were 2,500 fatalities and 660,000,000 tons of coal mined. That does not convey very much to my mind. Possibly it would if he could tell me the number of miners employed and what percentage, and how that compares with practice in some of the other countries.

MR. GREENWALD: I am sorry to say I do not have any information as to the number of miners employed. Do you, Mr. Howell?

MR. HOWELL: I do not know that, but the average miner mines in the neighborhood of five tons per shift.

MR. GREENWALD: Assuming that each miner mines five tons per shift, and an average of 200 shifts a year, he mines 1,000 tons a year, which means probably 660,000 miners. And you kill 2,500 out of 660,000. That is a big turnover for death. I do not know what the ratio of the number of grade crossing accidents is to the number of trains or the number of automobiles. But I do know this, that most of them turn out to have been caused by somebody's foolishness. Likewise many of the deaths in mines are due to ignorance.

Note—Since the meeting I have had time to look up additional information in answer to Col. Milliken's question. The number of men employed in 1926 is estimated at 742,000 and the production per man per year at 894 tons. These men are not to be considered full-time workers. The total number of shifts worked was probably in the neighborhood of 140,000,000. More accurate figures are available for 1925 in which 748,805 men were employed, 144,068,232 shifts were worked and 2,234 men were killed. The number of shifts is equivalent to 480,227—300-day workers, and the fatality rate was 4.65 per 1,000 300-day workers. It is not advisable to compare fatality rates in this country and abroad without a number of qualifications because of the differences in conditions and methods of mining.

MR. R. L. KIRKPATRICK: (Westinghouse Elec. & Mfg. Co.) I know something of the time and effort put into the development of the permissible electric locomotive. We go to a great expense to make a permissible locomotive to meet the requirements of the Bureau of Mines and get the electric spark

out of the mines, but the question that concerns me is—What precautions are taken to eliminate sparks from the sliding of the wheel on the rails or the friction of the brake shoes on the wheel?

MR. GREENWALD: That question has been studied a great deal. There are some explosions which have occurred with nobody in the mine. That may sound very odd. There was an explosion that occurred in Australia, or New Zealand, I have forgotten which, in a mine that had not been worked for several months. The fan had not been run and as it was a shaft mine there was not much chance of anybody getting in. Yet an explosion occurred of such violence that it threw the cable and cage up the shaft and jammed it in the head frame.

A mine explosion occurred in a gassy mine in Canada when there were only two men in the mine, and it was determined that neither of them could have started it. How did it start? It was assumed that gas was ignited by sparks from falling rock.

Explosions have been blamed on frictional sparks and yet the fact remains that experiment after experiment has been made to ignite gas in the laboratory by means of frictional sparks and practically all have failed. The only way it could be done was by arranging a set of conditions which were not likely to occur in a mine. Gas is ignited only with great difficulty by frictional sparks. Maybe they do cause explosions, but we can not reproduce it in the laboratory. If they do there is some condition that we can not control or reproduce and I think under ordinary conditions it may be dismissed from consideration in mine explosions. In the case I spoke of where the rock was blamed, it was a rock which gave unusually large sparks when struck.

Here is another point about gas which is very much in the miner's favor. Methane gas must be in contact with the source of ignition a certain length of time before it lights. This is called the lag of ignition. The time is only a fraction of a second in most cases but the fraction of a second is frequently sufficient to save the day. It is that fraction of a second that saves it with a short flame explosive.

PRESIDENT: Mr. F. B. Doane, Chemical Engineer of the Pittsburgh Laboratories, is here tonight and we would like to have a word from him.

MR. F. B. DOANE: This is my first appearance here. This discussion is very interesting to me because I was once connected with the Bureau of Mines and engaged in permissible explosive work. The stick of dynamite shown on the screen had a very familiar appearance for I have cut up and sampled a great many of them and got some quite severe headaches in doing it. Nitroglycerin is not only an explosive but is also a very violent poison and if you handle it any length of time you are apt to get a severe headache and it can even knock you out completely. I have had that happen to me in analyzing dynamite for the Panama Canal. So Mr. Greenwald's talk was especially interesting to me and I have very much enjoyed my first appearance at your meetings.

MR. F. H. STARK: I would like to ask the speaker as to whether the rock dust method is commonly used and whether it is expensive on account of the great volume of rock dust used daily. And what effect does it have on equipment traveling through this dust constantly? I know bearings on mine locomotives and cars wear very fast with coal dust. I wonder what it does with rock dust. Another point is whether they are successful in getting the miners together as a body to receive instruction from those pictures.

MR. GREENWALD: In order to answer that question let us understand first that the Bureau of Mines is a United States Government institution. The control of coal mines is a state matter. We can not compel any man to do anything. And sometimes it is a good thing we can not. We get a lot of things now in the way of information that we could not get if we had police powers . We have had to educate people of all degrees of responsibility. It is a slow process but we are beginning to get results. There are three states that have compulsory rock-dusting laws. Utah was the first, Indiana was the second, and I am not sure whether the Oklahoma law is in force yet or not. And I believe that Pennsylvania will have such a law before many years pass. The larger companies have taken it up because they know they have got to do it to be safe. Rock dusting costs anywhere from 1 cent to 2 cents per ton of coal produced. Two cents for an ordinary mine is a pretty fair price.

You can get a reduced insurance rate if a mine is rock-dusted and that is what puts rock dusting ahead. It is going

to become universal. At the present time a little less than 25 per cent of the coal produced comes from rock-dusted mines. There is no question that with proper education it will be compulsory in time. It has been compulsory in England for several years. The first years they had rock dusting it was not possible to keep the percentage of rock dust up to the legal requirement. But they kept at it. It was like soaking up dry ground. One man showed me a chart of five years rock dusting. He started with a low percentage but each year it ran up until he had a perfectly safe mine.

As to getting the miners together, I have not had enough experience in the field to know how thoroughly it is done. I do know that unless the company officials take it up and push it they will not get together. You have got to entertian the fellows and while you are entertaining them you get some good information in. There are lots of them that are not reached as they should be, but it is certainly reaching a good proportion.

I neglected to reply to the section of Mr. Stark's question concerning the effect of dust on bearings. Here again I lack information. Dust in any bearing will certainly cause added friction and wear. However modern cars have roller bearings that are so enclosed that it is practically impossible for dust to get in them. The matter is, of course, different with the old style loose wheel.

MR. W. R. SHANNON: I would like to offer a motion thanking the speaker of the evening for the paper just presented. It was very educative and enlightening both in its subject matter and the manner in which it was presented. While I do not know anything about coal mining I am very much interested in safety in industry and I would like to hear more things like this discussed during the coming year.

The motion was duly seconded, and carried by rising unanimous vote.

PRESIDENT: Mr. Greenwald, we thank you, and we would be pleased to have you as the guest of our Club at our next meeting, October 25.

MR. GREENWALD: I certainly thank you for your kind words and your expression of appreciation. We of the Bureau consider it a part of our duty to give information. We are in

business solely to find out facts and give them to people who will put them in practice.

PRESIDENT: Next in order is the report of the Nominating Committee. Mr. Lanahan.

MR. FRANK J. LANAHAN: In presenting the report on nominations, your Committee feel it encumbent upon them to explain that the gentleman who according to the precedent of the Club would succeed to the Presidency—the Vice President, Mr. Hankins, is now a resident of Philadelphia, and because of the distance to travel, which would necessitate absence from some of the meetings, he has declined the nomination. Of course, there is nothing for the Committee to do but accede to his wishes and accept the situation. When it came to the selection of an individual for the First Vice President, we were not unmindful that Mr. Hankins, who was compelled to decline the Presidency, was a Pennsylvania Railroad man, and so in following the honored precedent of rotation, we have designated another from that transportation system, Mr. E. W. Smith, Regional Vice President, here in Pittsburgh.

The full report of your Committee on Nominations is as follows:

President

W. S. McAbee, Vice President, Union Railroad Company.

First Vice President

E. W. Smith, Vice President, Pennsylvania Railroad.

Second Vice President

Professor Louis E. Endsley, Consulting Engineer.

Treasurer

E. J. Searles.

Secretary

J. D. Conway.

Executive Committee

(Eight to Elect) L. H. Turner, Frank J. Lanahan, A. Stucki, Samuel Lynn, D. F. Crawford, F. G. Minnick, G. W. Wildin, E. J. Devans.

Subject Committee

(To serve 3 years) Karl Berg.

Reception Committee

(To serve 3 years) Charles J. Nieman, George F. Laurent, A. B. White, F. I. Snyder.

Entertainment Committee

(To serve 2 years) Charles Orchard.
(To serve 3 years) F. M. Brown.

Membership Committee

(To serve 3 years) T. E. Cannon, Guy M. Gray, C. E. Peiffer, J. S. Lanahan.

(NOTE)—Members whose terms have not expired are not shown in above list of nominations and will not appear on the ballots, but will continue to serve for balance of term and on committee as elected.

SECRETARY: This report of the Nominating Committee, it should be understood, does not at all preclude any member from nominating any other names for any office he may wish. The ticket will be presented to the members for letter ballot between now and the next meeting, and I will ask any who wish to make additional nominations to get such names into my hands promptly, that they may be included with the report of the Committee in the ballot to be sent to the members.

The ballots will be counted on the day of the next meeting, October 25th, and the result of the election announced at that meeting, the officers elect taking office for the ensuing year beginning at the November meeting.

PRESIDENT: Is there any further business? If not, a motion to adjourn will be in order, and I hope you will not forget the lunch prepared in the rear of the auditorium.

ON MOTION: Adjourned.

J. D. CONWAY, Secretary.

In Memoriam

J. L. McCARTNEY,

Died, May 28, 1928.

W. O. QUEST,

Died, June 6, 1928.

W. H. FREY,

Died, June 9, 1928.

F. H. PARKE,

Died, June 16, 1928.

RODY P. MARSHALL,

Died, July 1, 1928.

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November, 1927—"A Few Current Observations." By *George D. Ogden, Traffic Manager, The Pennsylvania Railroad, Philadelphia, Pa.*

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January, 1928—"The Dispatcher Controlled Signal System for Train Operation." By *W. B. Rudd, Engineer, Union Switch & Signal Company, Swissvale, Pa.*

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May, 1928—"Supervision of Yard Operation." By *H. R. Fertig, Chief Yard and Terminal Operations, C. R. I. & P. Railway, Chicago.*

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Harry D. Vought, 26 Cortlandt St., New York City,
Secretary-Treasurer

September, 1927—"Elimination of Angle Cocks." By *W. H. Sitterly, Gen. Car Inspector, Penn. R. R*

October, 1927—"Without Train Orders." By *B. J. Schwendt, Asst. Signal Eng., Ohio Central Lines Div., N. Y. C. R. R., Cleveland, O.*

November, 1927—"Actual Economic Waste." By *T. A. Ward of Buffalo, District Freight Claim Agent, N. Y. C. R. R*

December, 1927—"Dieselizing Railroads." By *William Arthur, Manager, Traction Divisions, American-Brown-Boveri Electric Corp.*

January, 1928—Annual Meeting and Dinner. Addresses by *James Fitzgerald of New York and the Rev. Joseph R. Hanley, Wyoming County's Popular Legislator.*

February, 1928—"Continuous Switching Power." By *H. R. Fertig, Chief of Yard and Terminal Operation, Rock Island Lines.*

March, 1928—"Electrification of Railroads." By *F. E. Wynne, Railway Equipment Engineering Dept., Westinghouse E. & M. Co.*

April, 1928—"Pere Marquette's Big Innovation." By *Paul Chipman, of Detroit, Michigan, Valuation Engineer, Pere Marquette Railway.*

May, 1928—"New Era of Transportation." By *G. Metzman, Transportation Assistant to the President, N. Y. C. R. R.*

WESTERN RAILWAY CLUB

W. J. Dickinson, 189 W. Madison St., Chicago, Ill. Secretary

September, 1927—"Modern Yard Operation." By *W. B. Rudd, Union Switch & Signal Company.*

October, 1927—"Transportation." By *A. W. Towsley, Asst. to V. P., C. R. I. & P. Ry.*

November, 1927—"The Locomotive Yardstick." By *A. W. Bruce, Designing Engr., American Locomotive Co.*

January, 1928—"Improvements in Air Brakes." By *C. C. Farmer, Dir. Eng., Westinghouse Air Brake Co.* "Progressive Modernization of Air Brake Maintenance Practice." By *E. F. Wentworth, Sales Engr., New York Air Brake Co.*

February, 1928—"Why the Supply Man." By *George E. Haas, Pyle National Company.*

March, 1928—"Electro-Chemical Method for the Prevention of Locomotive Boiler Corrosion." By *L. O. Gunderson, Chemical Engineer, Chicago & Alton Ry.* "The Dispatcher Controlled Signal System for Train Operation." By *W. B. Rudd, Union Switch and Signal Company.*

April, 1928—"Modern Yard and Terminal Facilities." By *J. S. Morris, Engr. Shops & Machinery, N. Y. C. & St. L. R. R. M. Company, New York, N. Y.*

May, 1928—"Airplanes & Terminals." By *T. C. Powell, President C. & E. I. R. R.* "Aviation as a Transportation Agency." By *Hon. W. P. MacCracken, Assistant Secretary for Aeronautics, Department of Commerce.*

NEW ENGLAND RAILROAD CLUB

Wm. E. Cade, Jr., 683 Atlantic Avenue, Boston, Mass., Secretary.

October, 1927—"The Confederation of Canada and the Part Played by the Canadian Pacific Railway Company." By *C. A. Cotterell, General Superintendent, Canadian Pacific Railway.*

November, 1927—"Our New England: Its Lakes, Rivers, Mountains and Seashore." By *E. S. Jones.*

December, 1927—"Freight Classification Yards." By *George Hannauer, President, Boston & Maine Railroad.*

January, 1928—"Flood Damage and Reconstruction." By *William J. Backes, Chief Engineer, Boston & Maine Railroad.*

February, 1928—"The Diesel Engine in Railroad Traction." By *D. L. Bacon, Supervisor Automotive Equipment, New York, New Haven & Hartford R. R.*

April, 1928—"The Railroad's Side of Grade Crossing Accidents." By *A. H. Rudd, Chief Signal Engineer, The Pennsylvania Railroad.*

May, 1928—Annual Banquet and Entertainment.

ST. LOUIS RAILWAY CLUB

B. W. Frauenthal, Drawer 24, M. & P. O., St. Louis, Mo., Secretary-Treasurer

September, 1927—"Reminiscences." By *W. G. Besler, Chairman of Board, Central Railroad of New Jersey.*

October, 1927—"Industrial Development of the St. Louis District." By *George C. Smith, Director, Industrial Bureau of the Industrial Club.*

November, 1927—"Some Modern Challenges of the Law." By *Wm. G. Hale, Dean of the School of Law, Washington University.* "Union Dispatchers' Control Signal System." By *S. J. Turreff, Assistant Resident Manager, Union Switch and Signal Co.*

December, 1927—"Railroading in New England." By *George Hannauer, President, Boston & Maine Railroad.*

January, 1928—"Railroad Safety." By *Charles E. Hill, General Safety Agent, New York Central Lines.*

February, 1928—"The St. Louis Plan of Unified Railway Terminals." By *Thomas M. Pierce, Vice President and General Counsel, Terminal Railroad Association.* "Caprotti Poppet Valve Gear as applied to Locomotives." By *W. A. Austin, Consulting Engineer, Baldwin Locomotice Works.*

March, 1928—"Leadership." By *Lester C. Haworth, General Secretary, St. Louis Y. M. C. A.* "The Making of Iron and Steel." By *J. P. Butterfield, Development Department, American Rolling Mills Company, Middletown, Ohio.*

April, 1928—"The Railroad Situation of Today." By *Col. F. W. Green, Vice President, St. Louis-Southwestern Railway Company.*

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB

A. T. Miller, 120 E. Hunter St., Atlanta, Ga., Secretary.

July 1926—"The Advantages of Organization and The Maintenance of Motive Power." By *A. G. Pack, Chief Inspector, Bureau of Locomotive Inspection, I. C. C., Washington, D. C.*

September, 1926—"Application of the Oil-Electric Locomotive to Railroad Transportation." By *W. L. Garrison, Ingersoll-Rand Company, New York.*

September, 1927—"Experiments on Pigments for Iron and Steel." By *Edgar W. Fasig, Asst. Gen. Supt., Lowe Bros. Co., Dayton, O.* "Lnmber." By *J. E. McNelley, Chief Tie and Lumber Supervisor, Atlantic Coast Line, Wilmington, N. C.*

November, 1927—"Process in Conversion of Steel into Railroad Products." By *George A. Richardson, Manager, Technical Publicity Dept. Bethlehem Steel Co., Bethlehem, Pa.*

January, 1928—"Small Tools Used in Railroad Shops." By *A. H. d'Arcambal, Pratt & Whitney Company, Hartford, Conn.*

March, 1928—"Recent Developments and Progress in Electric Arc Welding." By *W. W. Reddie, Head of the Motor Generator and Welding Section, Westinghouse E. & M. Company, Pittsburgh, Pa.*

May, 1928—"Modern Yard Operation with Electro-Pneumatic Car Retarders." By *W. B. Rudd, Specialist in Yard Operation, Union Switch & Signal Co., Swissvale, Pa.*

CANADIAN RAILWAY CLUB

Charles R. Crook, 129 Charron St., Montreal, Que., Secretary.

September, 1927—"Fifty Years of Telephone Progress." By *L. St. J. Haskell, Assistant to Vice President, Bell Telephone Co. of Canada.*

October, 1927—"Car Retarders in the Hump Yard." By *W. B. Rudd, Engineer, Union Switch & Signal Co., Pittsburgh.*

November, 1927—"Transportation." By *H. C. Taylor, Superintendent Transportation, Canadian Pacific Railway, Montreal.*

December, 1927—"The Importance of Locomotive Assignment." By *H. J. Titus, Transportation Engineer, Franklin Railway Supply Co., New York City.*

January, 1928—"The Properties of Manganese Steel." By *J. H. Hall, Chief Metallurgical Engineer, Taylor Wharton Iron & Steel Co., Highbridge, N. J.*

February, 1928—"Locomotive Boiler Development." By *C. A. Brandt, Chief Engineer, The Superheater Co., New York City.*

March, 1928—"Railway Law." By *F. F. Collins, Montreal.*

April, 1928—"Television." By *R. W. King, Assistant Director of Publications, Bell Laboratories, New York City.*

THE CLEVELAND RAILWAY CLUB

F. L. Frericks, 14416 Alder Avenue, Cleveland, Ohio, Secretary and Treasurer

October, 1927—"The Locking of Angle Cock Handles in the Open Position." By *W. H. Sitterly, General Car Inspector, Penna. R. R., Buffalo, New York.*

November, 1927—"Interchange Problems." By *C. J. Nelson, Chief Interchange Inspector, Chicago, Ill.* Modern Yard Operation." By *K. E. Kellenberger, Union Switch & Signal Co., Swissvale, Pa.*

December, 1927—"Car Heating Problems." By *W. H. Tucker, Representative of the Vapor Car Heating Inc., New York, N. Y.*

February, 1928—"Interchange Problems." By *C. J. Nelson, Chief Interchange Inspector, Chicago, Ill.*

March, 1928—Discussion of the 1928 A. R. A. Mechanical Rules.

April, 1928—"Rust Prevention." By *T. J. Fay, President of the Fay Metal Patch Co., Cleveland, O.*

May, 1928—"The Age of Riveted Steel." By *A. F. Jensen, President, Hanna Engineering Works, Chicago, Ill.*

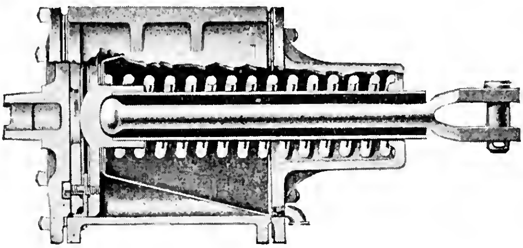
June, 1928—"The Man and His Job." By *D. F. Stevens, General Superintendent, B. & O. R. R., Cleveland, O.*

THE MEETINGS OF THE SOCIETY HAVE BEEN HELD EVERY OTHER YEAR AT ATLANTIC CITY IN CONNECTION WITH THE CONVENTIONS OF THE MECH., DIV., AMERICAN RAILROAD ASSOCIATION. THEY MAY HEREAFTER BE HELD ANNUALLY.

Chairman, C. R. Crook, *Canadian Railway Club.*
Vice-Chairman, A. T. Miller, *S. and S. W. Ry. Club.*
Secretary-Treasurer, Harry D. Vought, *New York Railroad and Central Railway Clubs, New York, N. Y.*

OFFICIAL PROCEEDINGS
RAILWAY CLUB OF PITTSBURGH
$1.00 Per Year 25¢ Per Copy
Vol. XXVII OCT. 25, 1928 No. 9

Annual Meeting—Constitution and By-Laws—List of Members



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OF
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Vol. XXVII No. 9. **Pittsburgh, Pa., Oct. 25, 1928.** $1.00 Per Year 25c Per Copy

Meetings held fourth Thursday of each month except June, July and August

PROCEEDINGS OF ANNUAL MEETING
OCTOBER 25, 1928

The meeting was called to order at the Fort Pitt Hotel, Pittsburgh, Pa., by the Secretary in the absence of the President, at 8:00 o'clock P. M.

The following gentlemen registered:

MEMBERS

Allen, Harvey
Altsman, W. H.
Ambrose, W. F.
Anger, C. E.
Anger, J. G.
Ashton, William A.
Babcock, F. H.
Baehner, Martin G.
Baer, Harry L.
Baker, H. M.
Bald, E. J.
Ball, Fred M.
Balzer, C. E.
Barrett, R. L.
Bates, H. W.
Beam, E. J.
Bednar, Joseph J.
Berg, Karl
Berghane, A. L.
Bernoulli, W. H.
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Blackwell, W. B.
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Blest, M. C.
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Bonhoff, E. L.
Bowery, Frank J.
Callahan, F. J.
Campbell, J. T.
Cannon, T. E.
Cherry, J. T.
Christy, F. X.
Cipro, Thomas
Clements, F. C.
Cohen, Alfred J.
Conlon, John F.
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Coulter, A. F.
Courtney, H. C.
Conway, J. D.
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Cotter, H. L.
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Croke, Thomas F.
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Cruikshank, J. C.
Cunningham, W. P.
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Dambach, C. O.
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Doran, F. E.
Eagan, D. F.
Edwards, C. H.
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Emery, C. W.
Emery, E.
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Fagan, R.
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Farrington, R. J.
Fendner, W. J.
Fieldson, P. H.
Fink, P. J.
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Fisher, John J.
Fleckenstein, August
Fletcher, Albert
Flinn, R. H.
Flynn, E. E.
Follett, W. F.

Fowler, W. E., Jr.
Freshwater, F. H.
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Gordon, George A.
Gray, Guy M.
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Woernley, H. F.
Womack, C. F.
Wright, C. P.
Yetter, J. B.

SECRETARY: It is an unfortunate announcement I have to make, that due to illness our President, Mr. Devans, will not be able to be with us upon this occasion. With your approval, I will call to the chair a gentleman well known to all the membership, a past-President of this Club and a gifted orator of our city, Mr. Frank J. Lanahan.

CHAIRMAN LANAHAN: As the Secretary has already called the meeting to order, it would be superfluous for me to say, "Gentlemen, be seated."

First in the order of business is the roll call. That may be dispensed with, as we have a record of attendance on the registration cards. The reading of the minutes will also be dispensed with as the minutes have already been printed and sent to the members.

I will ask the Secretary to read the list of applications for membership.

SECRETARY: I have the following applications for membership:

Ashley, F. B., General Manager of Sales, Pruett-Schaffer Chemical Company, Tabor Street, Corliss Station, Pittsburgh, Pa. Recommended by Samuel Lynn.

Caldwell, C. W., Representative, James B. Sipe & Company, Chamber of Commerce Building, Pittsburgh, Pa. Recommended by W. H. Altsman.

Clark, Edward J., Superintendent Electrical Construction, Byllesby Engineering & Management Corporation, 2927 Mattern Avenue, Pittsburgh, Pa. Recommended by W. H. Altsman.

Doemling, Joseph J., Sheet Metal Worker, Kirch Sheet Metal Company, 3465 Ligonier Street, Pittsburgh, Pa. Recommended by Oscar G. A. Moyer.

Flinn, R. H., Superintendent Motive Power, Pennsylvania Railroad, Pittsburgh, Pa. Recommended by H. E. Passmore.

Garant, E. J., Sales Manager, Buckeye Chemical Company, 1351 Porter Street, Detroit, Mich. Recommended by E. A. Rauschart.

Gorman, Charles, District Manager, The Garland Company, 227 Chemung Street, N. S., Pittsburgh, Pa. Recommended by W. H. Altsman.

Jones, V. J., Representative, James B. Sipe & Company, Chamber of Commerce Building, Pittsburgh, Pa. Recommended by W. H. Altsman.

Kiefer, Fred, Pasteurizer, Rieck-McJunkin Dairy Company, 4915 Jordan Street, E. E., Pittsburgh, Pa. Recommended by Oscar G. A. Moyer.

Matthews, R. J., Salesman, Edgewater Steel Company, P. O. Box 249, Pittsburgh, Pa. Recommended by C. A. Karns.

Miller, J. Alfred, Jr., General Manager of Sales, Vanadium Corporation of America, Oliver Building, Pittsburgh, Pa. Recommended by W. S. McAbee.

McKinley, Archie, Locomotive Inspector, P. & L. E. R. R., 613 Broadway, McKees Rocks, Pa. Recommended by Karl Berg.

McLaughlin, L. S., Car Inspector, P. & L. E. R. R., R. D. No. 2, Beaver Falls, Pa. Recommended by Samuel Lynn.

Nordfeld, H. C., Sales Engineer, Continental Sales & Engineering Company, Oliver Building, Pittsburgh, Pa. Recommended by Frank K. Mitchell.

Pringle, J. L., Train Master, Pennsylvania Railroad, 1003 Penn Avenue, Pittsburgh, Pa. Recommended by D. F. Eagan.

Ricker, H. M., Freight Agent, P. & L. E. R. R., Twenty-third Street, Pittsburgh, Pa. Recommended by J. T. Campbell.

Seroky, E. A., Assistant Shipper, Fort Pitt Malleable Iron Company, 838 Russellwood Avenue, McKees Rocks, Pa. Recommended by Frank J. Lanahan.

Taylor, Clifton, Sales Manager, Molybdenum Corporation of America, Empire Building, Pittsburgh, Pa. Recommended by J. A. Ralston.

Vollmer, Karl L., Asistant Steam Engineer, Spang-Chalfant & Company, 106 West Undercliff Street, Etna, Pa. Recommended by W. H. Ritts.

Weber, Roy H., Sales Engineer, W. H. Miner, Inc., Rookery Building, Chicago, Ill. Recommended by Samuel Lynn.

West, George S., Master Mechanic, Pennsylvania Railroad, 103 Emerson Avenue, Aspinwall, Pa. Recommended by T. M. Blakley.

Wright, E. W., Assistant to President, Fort Pitt Malleable Iron

Company, 5442 Baywood Avenue, Pittsburgh, Pa. Recommended by Frank J. Lanahan.

Zoeller, Charles P., Engineer, P. H. B. & N. C. Co., Evans City, Pa. Recommended by W. H. Altsman.

CHAIRMAN: These applications will be referred to the Executive Committee in accordance with our rules, and upon approval by them, the gentlemen will become members without further action.

Next we will hear the report of the Tellers of Election.

SECRETARY: The ballots received for the election of officers of The Railway Club of Pittsburgh for the ensuing year totaled 264. The ballot resulted in the unanimous election of the following:

PRESIDENT—W. S. McAbee, Vice President, Union Railroad Company.

FIRST VICE PRESIDENT—E. W. Smith, Vice President, Pennsylvania Railroad Company.

SECOND VICE PRESIDENT—Professor Louis E. Endsley, Consulting Engineer.

SECRETARY—J. D. Conway.

TREASURER—E. J. Searles, Schaefer Equipment Company.

EXECUTIVE COMMITTEE—L. H. Turner, Chairman; Frank J. Lanahan, A. Stucki, Samuel Lynn, D. F. Crawford, F. G. Minnick, G. W. Wildin, E. J. Devans.

SUBJECT COMMITTEE*—J. A. Ralston, Chairman; 1 year; A. M. Candy, 2 years; Karl Berg, 3 years.

ENTERTAINMENT COMMITTEE*—Norman Allderdice, Chairman, 1 year; Charles Orchard, 2 years; F. M. Brown, 3 years.

FINANCE COMMITTEE*—John B. Wright, Chairman, 1 year; T. M. Blakley, 2 years; J. H. Carroll, Jr., 2 years; W. P. Cunningham, 2 years; W. C. Hansen, 2 years.

RECEPTION COMMITTEE*—A. B. Severn, Chairman, 1 year; L. V. Stevens, 1 year; O. L. Wright, 2 years; Charles J. Nieman, 3 years; George F. Laurent, 3 years; A. B. White, 3 years; F. I. Snyder, 3 years.

*In addition to newly elected committee members, the above list also gives names of those previously elected whose terms of office have not yet expired.

MEMBERSHIP COMMITTEE*—J. E. Hughes, Chairman, 1 year; J. L. Cunningham, 1 year; C. M. White, 1 year; A. F. Coulter, 1 year; Otis R. Hale, 2 years; E. A. Rauschart, 2 years; T. E. Cannon, 3 years; Guy M. Gray, 3 years; C. E. Peiffer, 3 years; J. S. Lanahan, 3 years.

CHAIRMAN: Are there any announcements?

SECRETARY: Since our last meeting we have received notice of the death of two very prominent members of this Club. Mr. J. A. Spielmann, Assistant to the General Superintendent, Baltimore & Ohio Railroad, who died October 7; and Mr. C. H. McConnell, Mechanical Engineer, Pittsburgh & Lake Erie Railroad, who died October 20.

CHAIRMAN: An appropriate memorial minute will appear in the next issue of the Proceedings.

Next we will hear the Annual Report of the Secretary.

SECRETARY'S REPORT

Pittsburgh, Pa., October 25, 1928.

To the Officers and Members of
The Railway Club of Pittsburgh.

Gentlemen:

The following is a summary of membership and financial statement for the fiscal year ended October 25, 1928:

Reported last year	1,259	
Received into membership during the year	198	
		1,457
Suspended, non-payment of dues	117	
Resigned	51	
Loss of address	15	
Deaths reported during the year	15	
		198
Present membership		1,259

Of the above membership four are honorary. They are: D. C. Buell, Samuel O. Dunn, Julian Kennedy and John A. Penton.

DECEASED MEMBERS

Name	Died
A. E. Anderson	October 30, 1927
W. H. Frey	June 9, 1928
Charles Houston	November 2, 1927
Frank E. LeGoullon	December 19, 1927
Rody P. Marshall	July 1, 1928
John M. Meyers	October 21, 1927
John M. Milliken	March 2, 1928
F. I. Mundy	September 6, 1927
J. L. McCartney	May 28, 1928
C. H. McConnell	October 20, 1928
F. H. Parke	June 16, 1928
W. O. Quest	June 6, 1928
D. J. Redding	December 8, 1927
J. A. Spielmann	October 7, 1928
Samuel Zimmerman	January 1, 1928

FINANCIAL

Receipts

In hands of Treasurer at close of last year	$7,028.10	
From advertisements	2,406.29	
From dues	3,321.00	
From sales of Proceedings	131.94	
From sale of tickets, Moving Picture, May 4, 1928	128.50	
Smoker tickets and dinner, October 27, 1927	746.50	
From interest, Liberty Bonds and bank balance	153.70	
Incidentals	1.68	
		$13,917.71

Disbursements

Printing Proceedings, Notices, Mailing, etc.	2,959.62
Hall, luncheons, cigars, etc.	793.87
Reporting Proceedings	180.00
Luncheon, Entertainment, etc., Smoker, October 27, 1927	951.85
Messenger Service, Affidavits, etc.	14.50
Moving pictures	60.00
Premium on Bonds, Treasurer and Secretary	17.50
Expense, moving picture, "Baffin Land and Beyond", May 4, 1928	498.00

Dues, Society Railway Club Secretaries......	15.00	
Floral Pieces	20.00	
Salaries and advertising expenses...........	1,240.63	
Incidentals	9.07	
		6,760.04
Net Balance		$ 7,157.67

Cash is made up of $4,157.67, two United States Liberty Bonds $1,000.00 each and $1,000.000 cash received account redemption of one United States Liberty Bond.

J. D. CONWAY, Secretary.

Approved:

L. H. TURNER, Chairman,

FRANK J. LANAHAN, D. F. CRAWFORD,
A. STUCKI, F. G. MINNICK,
SAMUEL LYNN, G. W. WILDIN,

Executive Committee.

CHAIRMAN: This report goes to the Executive Committee and is very carefully audited. The Chair will entertain a motion that the report be received and filed.

ON MOTION it is so ordered.

CHAIRMAN: Next in order is the Annual Report of the Treasurer.

TREASURER'S REPORT

To the Officers and Members of
The Railway Club of Pittsburgh.

Gentlemen:

I herewith submit Treasurer's Report for the year ended October 25, 1928:

ON HAND AND RECEIPTS

On hand October 28, 1927..................	$4,028.10	
Redemption one $1,000.00 United States Liberty Bond	1,000.00	
Cash received from J. D. Conway, Secretary..	6,735.91	
Interest on Liberty Bonds..................	106.25	
Interest on bank balance..................	47.45	
Total		$11,917.71

DISBURSEMENTS

Paid on Secretary's vouchers Nos. 618 to 653, inclusive		6,760.04
Balance		$ 5,157.67

RESOURCES

Two U. S. Liberty Bonds, $1,000.00 each.....$2,000.00		
Cash balance on hand October 25, 1928...... 5,157.67		
Total		$ 7,157.67

E. J. SEARLES, Treasurer.

Approved:

L. H. TURNER, Chairman,

FRANK J. LANAHAN, D. F. CRAWFORD,
A. STUCKI, F. G. MINNICK,
SAMUEL LYNN, G. W. WILDIN,

Executive Committee.

We have audited the accounts of the Secretary and Treasurer and find them correct as reported.

JOHN B. WRIGHT, Chairman,
WILLIAM C. HANSEN,
J. H. CARROLL, JR.,
Members of Finance Committee.

ON MOTION the Report of the Treasurer is received and filed.

CHAIRMAN: Having passed through the ordeal myself, I know what the next ORDER OF BUSINESS IS. It is a time honored custom in this Club to present to the retiring President on behalf of the membership some token of appreciation for the services that have been rendered by the retiring President. This is, I think, the first time in the history of the Club that the recipient of that honor has been unable to be present at that function. Owing to the unfortunate illness of President Devens, it will be necessary for him to receive this expression of the Club's appreciation by proxy. Often has reference been made as to what the play Hamlet would be without the melancholy dane, or strawberry shortcake without the berries, but this is the first time this Club has had to present its token of regard and affection to its chief executive officer while he was absent.

To make the presentation, there has been selected a friend of the retiring President, a gentleman well known in this community, who occupies a position in public life that is outstanding, and who is one of the best known members of the Lower House at Washington. His good offices in behalf of this locality, and his great work for humanity in restricting the opium traffic have made him an international character. It is my proud distinction to introduce to you as the orator of the evening, the friend of our President, whom you will all be glad to hear, the Honorable Stephen G. Porter.

The Hon. Stephen G. Porter at this point, in a very eloquent and interesting speech, made presentation in behalf of the Club of the very fine equipment to the retiring President, Mr. E. J. Devans, who unfortunately could not be with us upon the occasion. The presents consisted of a complete fishing tackle outfit, a very handsome shotgun and a beautiful hunting scene picture.

CHAIRMAN: Wasn't that beautifully done? Congressman Porter is a master of language as well as a lover of outdoors, and he certainly betrays his fondness for God's playground, but in his flight of oratory he overlooked this picture also included in the Club's presentation to our retiring President.

We are now ready to turn you over to the Entertainment Committee, but I cannot resign the chair without telling you a story I heard the other day: "A couple of fellows were talking about some of the marvels of recent invention, when one said to the other, 'Did you ever see one of those contraptions that can tell when a fellow is lying?' His friend looked at him a moment, then said, 'Did I ever see one? Hell, I married one.'

Just a little encore for the benefit of you radio fans. "A young lady rather recently married was delighted when her husband permitted her to have a hired girl. She immediately started to the bridge whist club to tell the members of her good fortune. She had not more than a flying start on the fine news, when the telephone rang and she was called to the 'phone, and a Swedish voice called to her, 'Please, Mum, come home quick, I got the 'terminisuses' mixed and everything's gone wrong; the radio is covered with frost and the electric refrigerator is singing, 'The Sidewalks of New York.'"

It is now my duty and your pleasure to dispense with your

presiding officer and turn the meeting over to the Entertainment Committee.

The entertainment consisted of five three-round boxing bouts, the principals being furnished by the Baltimore & Ohio, Pennsylvania, Pittsburgh & West Virginia and Union Railroad Companies, Mr. W. S. Haddock, President, American Athletic Union, acting as referee. Messrs. C. A. Finley, Traction Board Chairman, and William H. Boyce, Commercial Manager, Pittsburgh Railways Company, provided the ring equipment. Mr. James N. McGrath, Jr., acted as Stage Manager.

In addition to above, Mr. Russell C. Sturgeon rendered several vocal numbers accompanied by Mr. E. Herbert Gilg at the piano.

CHAIRMAN: Before we adjourn to the tables for the evening lunch, I think we should express our very high appreciation as an organization for the courtesy of the different transportation companies that have furnished the entertainment tonight. On behalf of the Railway Club of Pittsburgh, I extend to them our sincere thanks.

J. D. CONWAY, Secretary.

CONSTITUTION

ARTICLE I

The name of this organization shall be "The Railway Club of Pittsburgh."

ARTICLE II

OBJECTS

The objects of this Club shall be mutual intercourse for the acquirement of knowledge, by reports and discussion, for the improvement of railway operation, construction, maintenance and equipment, and to bring into closer relationship men employed in railway work and kindred interests.

ARTICLE III

MEMBERSHIP

Section 1. The membership of this Club shall consist of persons interested in any department of railway service or kindred interests, or persons recommended by the Executive Committee upon the payment of the annual dues for the current year.

Sec. 2. Persons may become honorary members of this Club by a unanimous vote of all members present at any of its regular meetings, and shall be entitled to all the privileges of membership and not be subject to the payment of dues or assessments.

ARTICLE IV

OFFICERS

The officers of this Club shall consist of a President, First Vice President, Second Vice President, Secretary, Treasurer, Finance Committee consisting of five or more members, Membership Committee consisting of seven or more members, Entertainment Committee consisting of three members, Reception Committee consisting of six or more members, Subject Committee consisting of three or more members, and an Elective Executive Committee of three or more members. The officers named shall serve a term of one year from date of their election, with the exception of the Finance, Membership, Entertainment, Reception and Subject Committees; the term of office of these committees shall be specified at the time of the Annual Election, but the term

of office of the members of such committees shall not exceed three years.

ARTICLE V

DUTIES OF OFFICERS

SECTION 1. The President shall preside at all regular or special meetings of the Club and perform all duties pertaining to a presiding officer; also serve as a member of the Executive Committee.

SEC. 2. The First Vice President, in the absence of the President, will perform all the duties of that officer; the Second Vice President, in the absence of the President and First Vice President, will perform the duties of the presiding officer. The First and Second Vice President shall also serve as members of the Executive Board.

SEC. 3. The Secretary will attend all meetings of the Club or Executive Committee, keep full minutes of their proceedings, preserve the records and documents of the Club, accept and turn over all moneys received to the Treasurer at least once a month, draw cheques for all bills presented when approved by a majority of the Executive Committee present at any meetings of the Club, or Executive Committee meeting. He shall have charge of the publication of the Club Proceedings and perform other routine work pertaining to the business affairs of the Club under the direction of the Executive Committee.

SEC. 4. The Treasurer shall receipt for all moneys received from the Secretary, and deposit the same in the name of the Club within thirty days in a bank approved by the Executive Committee. All disbursements of the funds of the Club shall be by checque signed by the Secretary and Treasurer.

SEC. 5. The Executive Committee will exercise a general supervision over the affairs of the Club and authorize all expenditures of its funds. The elective members of this Committee shall also perform the duties of an auditing committee to audit the accounts of the Club at the close of a term or at any time necessary to do so.

SEC. 6. The Finance Committee will have general supervision over the finances of the Club, and perform such duties as may be assigned them by the President or First and Second Vice Presidents.

SEC. 7. The Membership Committee will perform such duties as may be assigned them by the President or First and Second Vice Presidents and such other duties as may be proper for such a committee.

SEC. 8. The Entertainment Committee will perform such duties as may be assigned them by the President or First and Second Vice Presidents, and such other duties as may be proper for such a committee.

ARTICLE VI

ELECTION OF OFFICERS

SECTION 1. The officers shall be elected at the regular annual meeting as follows, except as otherwise provided for:

SEC. 2. Printed forms will be mailed to all the members of the Club, not less than twenty days previous to the annual meeting, by the elective members of the Executive Committee. These forms shall provide a method, so that each member may express his choice for the several offices to be filled.

SEC. 3. The elective members of the Executive Committee will present to the President the names of the members receiving the highest number of votes for each office, together with the number of votes received.

SEC. 4. The President will announce the result of the ballot and declare the election.

SEC. 5. Should two or more members receive the same number ballot .

ARTICLE VII

AMENDMENTS

Amendments may be made to this Constitution by written request of ten members, presented at a regular meeting and decided by a two-thirds vote of the members present at the next regular meeting.

BY-LAWS

ARTICLE I

MEETINGS

Section 1. The regular meetings of the Club shall be held at Pittsburgh, Pa., on the fourth Thursday of each month, except June, July and August, at 8 o'clock P. M.

Sec. 2. The annual meeting shall be held on the fourth Thursday of October each year.

Sec. 3. The President may, at such times as he deems expedient, or upon request of a quorum, call special meetings.

ARTICLE II

QUORUM

At any regular or special meeting nine members shall constitute a quorum.

ARTICLE III

DUES

Section 1. The annual dues of members shall be Two Dollars, payable in advance on or before the fourth Thursday of September each year.

Sec. 2. The annual subscription to the printed Proceedings of the Club shall be at the published price of One Dollar. Each member of the Club shall pay for both dues and subscription. Dues and subscription paid by members proposed at the meetings in September or October shall be credited for the following fiscal year.

Sec. 3. At the annual meeting members whose dues and subscription are unpaid shall be dropped from the roll after due notice mailed them at least thirty days previous.

Sec. 4. Members suspended for non-payment of dues shall not be reinstated until all arrearages have been paid.

ARTICLE IV

ORDER OF BUSINESS

1—Roll call.
2—Reading of the minutes.
3—Announcements of new members.
4—Reports of Committees.
5—Communications, notices, etc.
6—Unfinished business.
7—New business.
8—Recess.
9—Discussion of subjects presented at previous meeting.
10—Appointment of committees.
11—Election of officers.
12—Announcements.
13—Financial reports or statements.
14—Adjournment.

ARTICLE V

SUBJECTS—PUBLICATIONS

SECTION 1. The Subject Committee will provide the papers or matter for discussion at each regular meeting.

SEC. 2. The Proceedings or such portion as the Executive Committee may approve shall be published (standard size, 6x9 inches) and mailed to the members of the Club or other similar clubs with which exchange is made.

ARTICLE VI

The stenographic report of the meetings will be confined to resolutions, motions and discussions of papers unless otherwise directed by the presiding officer.

ARTICLE VII

AMENDMENTS

These By-Laws may be amended by written request of ten members, presented at a regular meeting, and a two-thirds vote of the members present at the next meeting.

MEMBERS

Abbott, J. A.,
Asst. Trainmaster,
Western Maryland Ry.,
Cumberland, Md.

Abraham, Walter S.,
Inspector,
Westinghouse Air Brake Company,
P. O. Box 666,
E. McKeesport, Pa.

Acheson, Walter C.,
Train Dispatcher,
A. & S. R. R. Co.,
Glenwillard, Pa.

Adams, Lewis,
Clerk, P. S. C. Co.,
McKees Rocks, Pa.

Adams, Walter A.,
Lubrication Inspector,
P. & L. E. R. R.,
714 Vermont Ave.,
Glassport, Pa.

Ainsworth, J. H.,
Director of Railroad Sales
A. M. Byers Co.,
Clark Building,
Pittsburgh, Pa.

Allan, W. J.,
Sec. and Treas., Commissary Co. of America,
1665 New Haven Ave.,
South Hills Branch,
Pittsburgh, Pa.

Allderdice, Norman,
President & Treasurer,
Arch Machinery Co., Inc.,
1005 Park Bldg.,
Pittsburgh, Pa.

Allen, E. J.,
Salesman, Ingersoll-Rand Co., 706 Chamber of Commerce Bldg.,
Pittsburgh, Pa.

Allen, Harvey,
Consulting Engineer,
347 Columbia Ave.,
West View,
Pittsburgh, Pa.

Allen, H. A.,
Marine & Ry. Mgr.,
SKF Industries, Inc.,
40 East 34th St.,
New York, N. Y.

Allen, James P.,
President,
Union Steel Casting Co.,
62nd and Butler Sts.,
Pittsburgh, Pa.

Allison, John,
Sales Engineer,
Pgh. Steel Foundry Corp.,
Glassport, Pa.

Altman, C. M.,
Foreman Car Inspectors,
Penna. R. R. System,
Grapeville, Pa.

Altsman, W. H.,
Mechanical Engineer,
Harmony Railways,
67 Watsonia Blvd.,
N. S., Pittsburgh, Pa.

Ambrose, W. F.,
M. M., Aliquippa & So. R. R.,
1301 Meadow St.,
Aliquippa, Pa.

Anderson, G. S.,
Foreman,
Penna. System,
Box 19, Penna. Station,
Pittsburgh, Pa.

Anderson, N. P.,
Gen. Foreman,
P. & L. E. R. R.,
Wireton,
Allegheny Co., Pa.

Anger, C. E.,
Upholsterer Foreman,
P. & L. E. R. R.,
15 Richey Ave.,
N. S., Pittsburgh, Pa.

Anger, John G.,
General Foreman,
P. & L. E. R. R.,
Fifth Ave.,
Coraopolis, Pa.

Angstadt, Edward D.,
Piece Work Inspector,
P. & L. E. R. R.,
3121 Brunot Ave.,
Corliss Sta.,
Pittsburgh, Pa.

Anne, George E.,
Representative,
American Brake Shoe & Foundry Co.,
1101 Fourteenth Ave.,
Altoona, Pa.

Antes, Edwin L.,
General Foreman,
Pressed Steel Car Co.,
11 Frazier Ave.,
McKees Rocks, Pa.

Anthony, J. T.,
Vice President,
General Refractories Co.,
420 Lexington Ave.,
New York, N. Y.

Anthony, R. H.,
Freight Claim Agent,
P. & L. E. R. R.,
424 Terminal Bldg.,
Pittsburgh, Pa

Arensberg, F. L.,
President,
Vesuvius Crucible Co.,
Box 47,
Swissvale, Pa.

Armstrong, J. B.,
Sales Manager,
Monongahela Iron & Steel Company,
2208 First Nat Bank Bld.,
Pittsburgh, Pa

Armstrong, M. H.,
Asst. Yardmaster,
Mon. Con. R. R. Co.,
250 Freeport Ave.,
Mt. Oliver Station,
Pittsburgh, Pa.

Arnold, J. J.,
Sales Dept.,
Pressed Steel Car Co.,
1915 Farmers Bank Bldg.,
Pittsburgh, Pa.

Ashley, F. B.,
Gen'l. Sales Manager,
Pruett Schaffer Chemical Co.,
Tabor St.,
Corliss Sta.,
Pittsburgh, Pa.

Ashton, Wm. A.,
Die Foreman,
Schoen Works,
Carnegie Steel Co.,
1031 Tyndall St.,
Sheraden, Pa.

Atterbury, W. W.,
President, P. R. R. Co.,
Broad St. Sta.,
Philadelphia, Pa

Aulbach, A. J.,
Yardmaster, P. & L. E. R. R.,
318 Quincy Ave.,
Mt. Oliver Sta.,
Pittsburgh, Pa.

Ayers, H. B.,
President,
H. K. Porter Co.,
49th St. and A. V. Ry.,
Pittsburgh, Pa.

Babcock, F. H.,
Safety Agent,
P. & L. E. R. R.,
415 House Bldg.,
Pittsburgh, Pa.

Bachner, Martin G.,
P. W. I.—P. & L. E. R. R.,
1109 Church Ave.,
McKees Rocks, Pa.

Baer, Harry L.,
Pres. Water Treatment Co. of America,
220 Stanwix St.,
Pittsburgh, Pa.

Bailey, F. G.,
Mechanical Engineer,
Motor Truck Dept.,
Standard Steel Car Co.,
Butler, Pa.

Baily, J. H.,
Secy., Edgewater Steel Co.,
Oakmont, Pa.

Bain, Geo. F.,
Representative,
Copperweld Steel Co.,
Room 526,
30 Church St.,
New York, N. Y.

Baird, F. C.,
General Manager,
P. & W. Va. Ry.,
Wabash Building,
Pittsburgh, Pa.

Baker, H. M.,
Clerk,
Aliquippa & Southern R. R.,
Monaca Natl. Bank Bldg.,
Monaca, Pa.

Bakewell, Donald C.,
President, Duquesne Steel Foundry Co.,
Union Bank Bldg.,
Pittsburgh, Pa.

Bald, E. J.,
General Foreman,
Westinghouse E. & M. Co.,
2105 Lloyd Ave.,
Swissvale, Pa.

Ball, Fred M.,
District Manager,
Franklin Ry. Sup. Co., Inc.
1200 Cunard Building,
Philadelphia, Pa.

Ball, George L.,
Treasurer,
Ball Chemical Co.,
230 S. Fairmont Ave.,
Pittsburgh, Pa.

Balzer, C. E.,
Asst. Air Brake Supervisor,
P. & L. E. R. R.,
3133 West Carson St.,
Pittsburgh, Pa.

Bandi, E. John,
Bill Clerk, P. C. & Y. R. R.,
1115 Criss St.,
Pittsburgh, Pa

Bandish, Jos. M.,
District Manager,
Durametallic Corporation,
35 E. Wacker Drive,
Chicago, Ill.

Barclay, J. R.,
Cost Engineer,
P. & L. E. R. R.,
4 Oakwood Road,
Crafton, Pittsburgh, Pa

Barnett, Geo.,
Salesman,
W. W. Lawrence Co.,
West Carson St.,
Pittsburgh, Pa.

Barney, Harry,
President-Treasurer,
Barney Machinery Co., Inc.,
Union Trust Bldg.,
Pittsburgh, Pa.

Barnhart, F. L.,
Secretary,
Union Collieries Co.,
2212 Oliver Bldg.,
Pittsburgh, Pa.

Barr, H. C.,
Agent, P. & L. E. R. R.,
3134 West Liberty Ave.
So. Hills Station,
Pittsburgh, Pa.

Barrett, R. L.,
Supt., P. & W. Va. Ry.,
Wabash Bldg.,
Pittsburgh, Pa.

Bartholomew, W. S.,
Alder Court,
East End, Pittsburgh, Pa.

Batchelar, E. C.,
Manager, The Motch &
Merryweather Mach'y Co.,
1315 Clark Bldg.,
Pittsburgh, Pa.

Bateman, W. H. S.,
W. H. S. Bateman & Co.,
Commercial Trust Bldg.,
Philadelphia, Pa.

Bates, H. W.,
Manager of Sales,
Pgh. Testing Laboratory,
P. O. Box 1115,
Pittsburgh, Pa.

Battenhouse, John M.,
Chiropractor,
208 Westinghouse Ave.,
Wilmerding, Pa.

Bayer, George J.,
American Rolling Mill Co.,
112 Cross St.,
Butler, Pa.

Beam, E. J.,
Car Builder, Penna. System,
577 Fourth St.,
Pitcairn, Pa.

Beattie, J. A.,
General Superintendent,
McKeesport Con. R. R.,
1923 Frick Building,
Pittsburgh, Pa.

Beatty, George W.,
P. W. I.—P. & L. E. R. R.,
Dickerson Run, Pa.

Beck, Carl H.,
General Sales Manager,
Westinghouse Air Brake Co.,
Wilmerding, Pa.

Bednar, Jos. J.,
Master Mechanic,
Witherow Steel Co.,
347 Helen St.,
McKees Rocks, Pa.

Beegel, F. W.,
Chief Clerk,
Union Steel Casting Co.,
62nd and Butler Sts.,
Pittsburgh, Pa.

Beers, W. E.,
Sheet Metal Worker,
P. & L. E. R. R.,
P. O. Box No. 8,
Dawson, Pa.

Beeson, H. L.,
Inspector,
Monongahela Ry. Co.,
West Brownsville, Pa.

Beitzel, H. L.,
C. C. to Traffic Manager,
P. & L. E. R. R.,
1328 Rutherford Ave.,
Pittsburgh, Pa.

Beltz, John D.,
Supt., B. & O. R. R.,
So. Windsor Apts.,
Connellsville, Pa.

Bennett, Alonzo H.,
General Foreman,
B. R. & P. Ry.,
520 S. State St.,
Du Bois, Pa.

Bennett, Robert George,
General Superintendent M. P.,
P. R. R. System,
General Offices,
Philadelphia, Pa.

Benson, G. W.,
C. C. to Div. Engineer,
B. R. & P. Ry.,
413 W. Du Bois Ave.,
Du Bois, Pa.

Berg, Karl,
Asst. Supt. Motive Power,
P. & L. E. R. R.,
6319 Morrowfield Ave.,
Pittsburgh, Pa.

Berghane, A. L.,
Mechanical Expert,
Westinghouse Air Brake Co.,
Wilmerding, Pa.

Bernoulli, W. H.,
Pugh Bros.,
211 House Bldg.,
Pittsburgh, Pa.

Bevan, P. A.,
Asst. Works Manager,
Westinghouse Air Brake Co.,
Wilmerding, Pa.

Bier, Edward C.,
Yardmaster,
Mon. Con. R. R.,
117 Duffland Ave.,
Mt. Oliver, Pittsburgh, Pa.

Biggard, W. J.,
Elec. Fore., P. & L. E. R. R.,
2947 Stafford St.,
Corliss Sta., Pittsburgh, Pa.

Bigleman, E. P.,
Yard Master,
P. & W. Va. Ry.,
Gormley Ave.,
Carnegie, Pa.

Bihler, L. C.,
Asst. to Pres. and General
Traffic Manager,
Carnegie Steel Co.,
Carnegie Bldg.,
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In Memoriam

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C. H. McCONNELL,
Died, October 20, 1928

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

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STATE OF PENNSYLVANIA } ss:
COUNTY OF ALLEGHENY }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared J. D. Conway, Secretary, who having been duly sworn according to law, deposes and says that he is the Editor and Publisher, of the Official Proceedings—Railway Club of Pittsburgh.

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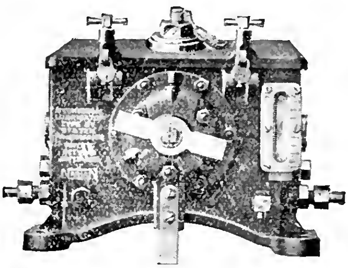

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